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Virtual reality tourism and technology acceptance: a disability perspective

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ABSTRACT

Virtual Reality (VR) is radically changing the tourism industry, and virtual tourism is gaining ground as an alternative form of tourism. People with disabilities could potentially have the biggest utilisation of virtual tourism. However, the success of virtual tourism depends on the acceptance of VR technology. This study investigates the acceptance of VR in tourists with disabilities. Drawing on the theory of planned behaviour, the technology acceptance model and the leisure constraints theory, a conceptual model is proposed mapping the elements for acceptance of VR for tourism-related activities in people with disabilities. Building on this conceptualisation, we propose several propositions to guide further research in this evolving area of enquiry.

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Virtual reality; disability; technology acceptance; virtual travel; tourism technology; leisure constraints

Introduction

Over 10% of the world's population is affected by disabilities, which amounts to around a billion people across the planet (Lyu, 2017; McKercher & Darcy, 2018; World Health Organization, 2015). After a long history of neglect, there has been a growing emphasis in many countries on improving the quality of life for people with disabilities (PwDs) (McKercher & Darcy, 2018). This is apparent with the introduction of conventions such as the United Nations Convention on the Rights of Persons with Disabilities having 162 countries as signatories (United Nations, 2006). It is also reflected in increased budget allocations by governments for dealing with disabilities. For example, in EU countries, the total amount spent on disability and sickness was around € 370 billion in 2018 (EUROSTAT, 2020). There has been an increasing appreciation in the tourism industry regarding constraints for the type of disability and the level of support needed (Darcy, Pegg, 2011).

However, disability research on tourism-related aspects is still in its infancy and on the margins of tourism scholarship (Orakani, 2020). Previous work concerning the tourism behaviour of PwDs has largely centred on identifying the tourism constraints faced by PwDs and exploring their individual and collective approaches towards disabilities. However, there are a few studies (Darcy, 2002; McKercher & Darcy, 2018; Yau et al., 2004) that focus on the type and variety of barriers that influence PwDs. This phenomenon is far more subtle than often described. Moreover, there is a need for an increased understanding of how tourists with disabilities use specific product offerings considering different forms of disabilities (Tecau et al., 2019). One such case is Virtual Reality (VR) enabled travel activities. In this study, VR is defined as a 3D experience where the user is engrossed in a virtual environment and visually isolated from the real environment using devices

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such as head-mounted displays (Rauschnabel et al., 2022). VR is now being used by the tourism industry in many developed countries to improve access for PwDs (Mura et al., 2017). For example, *Efteling*s, a theme park in the Netherlands, launched a virtual reality version of the 'dreamflight' attraction for PwDs that allows them to experience the attraction and socially interact with other users who are using the real version. The global sales of VR headsets rose by 92.1% in 2021 to reach 11.6 million units and are projected to grow to 50 million units by 2026 (IDC, 2022). Even though the current use of VR is relatively low among PwDs, many PwDs regard VR as a key to unlock previously inaccessible environments and experiences (Dick, 2021). Extant research on VR enabled travel has mainly concentrated on the development of applications and testing prototypes, with relatively little emphasis on underpinning models and frameworks (Loureiro et al., 2020). The last few decades have seen the development of human-centred approaches for understanding user acceptance of innovations considering the pace of ICT development and its influence on daily activities. However, the leisure and tourism literature on disability has not advanced significantly due to a lack of frameworks and conceptual models exclusive to PwDs (Aitchison, 2009). There have been recent calls for a more substantive and theory-based approach to user experience in VR-enabled travel and leisure activities (Huang et al., 2016; Rasul, 2021) and for insights focussing on extending the adaptations of well-known models and frameworks like the Technology Acceptance Model (TAM) and Stimulus Organism Response (S-O-R) to develop a VR-specific model (Loureiro et al., 2020), particularly in the context of PwDs (Maran et al., 2022; Singh et al., 2021). To fill this gap, this study proposes a VR tourism acceptance model for PwDs by reviewing and conceptualising disability, technology acceptance and VR research.

This paper offers three significant contributions. First, we describe the factors specific to PwDs, which can impact engagement and acceptance of VR in the tourism context and detail specific aspects of leisure constraints for PwDs relevant to VR. Second, in the light of the theory of planned behaviour, TAM and leisure constraints theory, we propose a conceptual model that maps these identified elements to acceptance of VR for tourism-related activities in PwDs. Third, we offer several propositions based on our model formulating an agenda for further research.

The next sections of the paper unfold as follows: In section 2, a review of disability and tourism, VR and tourism and technology acceptance behaviour is presented. In section 3, we construct a framework and an associated set of propositions for VR acceptance in PwDs. In section 4, we discuss the avenues for further research and conclude in section 5 with the implications.

Background

Disability, Leisure and Tourism

The experience of physically going to tourist attractions is a significant part of tourist expectations. However, because of various constraints, physically being in some tourist destinations might be impossible for certain groups of people. One of these groups is PwDs (Darcy, Buhalis, 2011; Darcy, Pegg, 2011). The Australian Human Rights Commission defines PwDs as the ones who are suffering from mobility, intellectual, psychological, aural, vision, neurological and learning disabilities. In their definition, they also include physical deformity and those with persistent pathogens (McKercher & Darcy, 2018). We refer to this definition when addressing people with disabilities. PwDs have a basic right to engage in leisure and tourism activities as reinforced by the United Nations international treaty (Condie, 2021). Tourism can have a hugely positive effect on the quality of life of PwDs and their general well-being. Experiencing travel and leisure is seen as a personal, social, dynamic and emotionally engaging activity by PwDs and others alike (Condie, 2021). However, on average there is a significant difference in the likes and dislikes of people with and without disabilities (Bennett et al., 2019).

The requirements and constraints of PwDs change depending on the types of impairments or disabilities (Singh et al., 2021). For example, tourists with visual impairment need documents with

the Blair alphabet. On the other hand, tourists with hearing impairment can only communicate effectively with the staff who know sign language (Bas, 2016). Several studies have tried to identify common constraints for PwDs. Freeman and Selmi (2010) identified four main types (physical, attitudinal, financial and communication) as tourism barriers for PwDs. Bas (2016) described environmental, social, personal and economic factors as common travel constraints for PwDs. Leisure travel barriers for tourists with disabilities are categorised into three dimensions by Smith (1987): intrinsic barriers, environmental barriers, and interactive barriers.

These barriers not only hinder opportunities for tourists with disabilities to access their favourite sites but also mirror the extent to which the tourism industry offers a tourism experience to those people. The industry as a whole has made relatively limited advancements to cater to PwDs, which is one of the fastest-growing tourism segments (Daruwalla & Darcy, 2005; Michopoulou & Buhalis, 2013; Shaw et al., 2007). One of the reasons for this limited success is the lack of appropriate infrastructure for PwDs with different types of disabilities (Darcy, Buhalis, 2011).

The extant research sheds light on the constraints and barriers to participation based on a set of individual and structural factors, which limit participation in leisure activities such as tourism (Choi et al., 2019). The leisure constraints theory first presented by Crawford and Godbey (1987) and extended subsequently (Crawford et al., 1991) acts as an important lens through which leisure behaviour such as tourism is studied (Godbey et al., 2010). Leisure constraints theory identifies intrapersonal, interpersonal, and structural constraints as factors, which affect preferences for leisure activity. This explains the relationship between constraints and subsequent leisure involvement such that constraints are seen as antecedents that condition activity preferences (Godbey et al., 2010). Technology can play a significant role in overcoming these constraints. For example, smartwatches can enable PwDs to navigate interpersonal constraints (e.g. access to constructive interactions) by transmitting fitness data to friends and well-being professionals (Du et al., 2021). This data can facilitate an increased understanding of the limitations and potential ways to overcome these limitations. Similarly, smart applications can allow PwDs to overcome some individual constraints by facilitating measurable progress and achievement in their leisure activities. Technologies can also extend and reform leisure activities. Orton-Johnson (2014) found that the usage of various technologies (e.g. web and mobile) has extended the boundaries of knitting as a leisure activity by providing users with access to real and virtual social sharing spaces.

VR and tourism

The impact of digital technologies on tourism behaviour has assumed ever greater significance in transforming traditional tourism into digital and smart tourism (Pencarelli, 2020). A strong interconnection has been developed between the technology and tourism industries. Innovative tourism relies on technologies such as VR (Pencarelli, 2020). 'VR is an interactive computer-generated medium that allows participants to create simulated experiences of both real and unreal situations' (Perry Hobson & Williams, 1997, p.34). VR itself is not new as its history dates back to 1962 but has recently emerged as a revolutionised product for the tourism industry. In the tourism context, Beck et al. (2019) described the concept of VR as 'VR creates a virtual environment (VE) by the provision of synthetic or real-life captured content with a capable immersive VR system, enabling virtual touristic experiences that stimulate the visual sense and potentially additional other senses' (Beck et al., 2019, p. 591). The immersive VR systems are mainly experienced using head-mounted displays, also called VR glasses (Herz & Rauschnabel, 2019). There are other ways of experiencing VR such as Cave Automatic Virtual Environment (CAVE) (Xi & Hamari, 2021). CAVE is a cube-shaped room that has projection screens in place of walls, ceilings and floors. Visual and aural stimuli along with some form of physical movements are the core of VR-based tourism (Xi & Hamari, 2021). There has been little progress so far in stimulating the sense of touch, smell and taste through VR-enabled experiences (Guttentag, 2020). Some studies refer to 3D content displayed on

2D screens as VR; however, this work does not encompass this type of non-immersive experience as VR (Rauschnabel et al., 2022).

The applications of VR to complement or replace tourism activities have been extensively discussed in extant literature (e.g. Beck et al., 2019; Gersdorf & Mayer, 2006; Guttentag, 2010; Huang et al., 2016; Mura et al., 2017), and there is consensus that VR offers several advantages for the tourism industry. Gersdorf and Mayer (2006) posit that VR can play a crucial role by creating a virtual experience for consumers called 'virtual tourism'. Virtual tourism enables the tourist to voyage without actually travelling to real destinations (Tavakoli & Mura, 2015). There are very few limitations for virtual tourists in terms of exploring different places across the world compared to corporeal travel (Mura et al., 2017; Tavakoli & Mura, 2015).

Huang et al. (2016) explored the extent to which 3D virtual tourism was being effectively marketed to technology users including potential customers and its impact on behaviour and intention. They found that the 3D virtual world offered opportunities for destinations' marketing organisations to communicate with targeted markets and potential customers. Furthermore, Mascho and Singh (2014) found that the 3D virtual world plays a crucial role in destination marketing organisations by offering the attractions of destinations to a potential target market. They assert that VR has a high potential of benefitting heritage preservation in certain situations, where tourists can enjoy the heritage sites virtually without damaging the sites (Mascho & Singh, 2014). Huang et al. (2013) detail how the virtual world of Second Life (SL) is used in areas of tourism marketing, tourism management, tourism education and tourist consumption behaviour. It can be inferred from these studies that VR offers an opportunity to build informative and interactive tourist destinations to attract potential online and real-world tourists.

VR for disability tourism

VR has enabled virtual accessibility to interesting tourist sites for PwDs (Ford, 2001; Smith, 1987). VR-based tourism allows PwDs to visit tourist destinations without travelling to particular places, especially those destinations that might be too remote, expensive, inhospitable or dangerous (Ford, 2001; Smith, 1987). Huh and Singh (2007) claim that VR can bring benefits to everyone, but PwDs who are not able to travel can acquire maximum benefit through the simulation of VR. A study by Ford (2001) investigates access of PwDs to alternative forms of tourism. He posits that VR devices can help PwDs bypass traditional barriers and enjoy interactive virtual travel experiences. Through VR, PwDs can also have opportunities to interact with other people (Perry Hobson & Williams, 1995).

VR can also be used to test the experience before actually travelling to a location (Wyld, 2010). Wyld (2010) studies the effect of using the virtual world to promote shows such as a virtual roller coaster, aerial ride, or rafting trip to take visitors' avatars on a programmed experience. This virtual world brought experiences, which were available only in a specific corner of the physical world to interest groups across the globe (Wyld, 2010). Perry Hobson and Williams (1997) found that VR game-players could have enhanced experiences by being put into an alternative three-dimensional world, where they can move around and interact with other players. For example, tourists with disabilities can be put in capsules where they can view and interact with the virtual world. Another form of VR is achieved by putting tourists with disabilities onto moving platforms, surrounded by sound, high-definition video or film, wind and water, which enables them to experience sensations of the real world.

In addition, VR is integrated into personal computer-based applications, which offer disabled virtual tourists the chance to travel without going outside, and users can experience virtual tours at home. The hedonism theory posits that people may enjoy virtual environments, which can enhance their relaxation (Holsapple & Wu, 2007). This corroborates the study of Standen and Brown (2005) on VR and the habitation of PwDs. Virtual tours offer benefits for tourists with specific characteristics, such as those who have disabilities. Standen and Brown (2005) also found the experiential

dimensions (immersion, absorption, pleasure, etc.) of virtual travel offered to people who cannot travel to visit virtual tourist destinations. The use of VR offers opportunities for PwDs to interact within a virtual world, and this will benefit them in terms of enhancing their tourist experience. This interaction could also have a positive impact on their health (Holsapple & Wu, 2007). PwDs can experience a second life or 'avatar'. VR can offer the uniqueness of tourism experiences by bringing tourism products to specific groups of tourists such as PwDs (Maran et al., 2022).

Technology acceptance behaviour

Several models have been proposed to explain the technology acceptance behaviour of users, mainly underpinned by the theory of reasoned action (Fishbein & Ajzen, 1975). The theory of reasoned action explains that human behaviour or action is driven by their intention to execute the behaviour or action and that the intention is determined by the attitude regarding the behaviour or action (Fishbein & Ajzen, 1975). The technology acceptance model (TAM) (Davis, 1989) and the unified theory of acceptance and use of technology (UTAUT) (Venkatesh et al., 2003) are two of the most widely used models explaining technology acceptance behaviours.

Based on the theory of reasoned action, Davis (1989) introduced TAM to predict technology acceptance behaviour. Within the model, the two main determinants of user acceptance and behavioural intentions are perceived usefulness and perceived ease of use. The adoption and usage of IT are determined by users' personal beliefs and attitudes towards technology (Davis, 1989). It also links to the hedonism theory because people might accept new activities based on their self-perception. Hedonism theory explains that the main driver of hedonic consumption is the unique consumer experience such as imaginal and emotional responses (Holsapple & Wu, 2007). While emotional responses mainly refer to the enjoyment and emotional involvement, imaginal responses refer mainly to fantasy, role projection and escapism (Holsapple & Wu, 2007).

TAM has been extensively used to study the adoption of new technologies (Loureiro et al., 2020). Therefore, TAM provides fundamental foundations to test VR tourism (Pantano & Corvello, 2014). Table 1 presents a summary of recent TAM studies in the context of VR for people without disabilities. Sagnier et al. (2020) extended TAM by combining elements of the technology acceptance model and user experience to study the acceptance and use of VR technology. They found that perceived ease of use did not have a significant effect on VR use intention (Sagnier et al., 2020). Manis and Choi (2019) proposed an extended TAM specific to VR hardware. Fussell and Truong (2021) studied the intention of students to use VR for learning. Acknowledging the various contexts, it is evident that TAM studies in the VR tourism context have received limited attention ((Disztinger et al., 2017; Guttentag, 2020; Huang et al., 2013). Chung et al. (2015) explored the acceptance of Augmented Reality (AR) and found that the intention of visiting a tourist destination is affected by the perceived usefulness and ease of use of AR-based tourism applications. tom Dieck, Jung, 2018 also discuss the TAM in the urban tourism context and propose an AR acceptance model. Recent extensions of TAM such as the senior technology acceptance model (Chen & Chan, 2014) have considered the distinct characteristics of older adults and identified these characteristics as important factors, which influence technology acceptance behaviours. Therefore, the acceptance of VR for PwDs requires a specific model owing to their unique characteristics.

VR acceptance model for persons with disabilities

TAM in its original form is quite generalised and may not capture all key factors affecting the acceptance of a technology (Manis & Choi, 2019). For a specific technology (e.g. VR) or a specific group of people (e.g. PwDs), it needs to be extended to accurately predict acceptance and use of the technology. Bennett et al. (2019) showed that the variables that offer a sound explanation of the attitude of PwDs do not explain the attitude of people without disabilities. Thus, the extension should be context-specific, and antecedents for perceived ease of use and perceived usefulness

Table 1. Studies exploring the acceptance of VR in people without disabilities.

Author	Focus	Main Constructs added to Original TAM	Context
(Disztinger et al., 2017)	Estimation of the potential of VR use in tourism	Accessibility, Perceived Immersion, Interest, Personal Innovativeness, Perceived Enjoyment, interest, Technology Anxiety, Scepticism	Leisure and Travel
(Mütterlein & Hess, 2017)	Factors influencing adoption and diffusion of VR	Immersion, Flow, Presence, Interactivity, Cybersickness, Trust, Age, Lag	Industrial context not specified
(Lee et al., 2019)	Effect of social networks on the adoption of VR	Age, income, gender, social interaction, strength of social ties	Entertainment
(Manis & Choi, 2019)	Factors influencing consumer acceptance of VR hardware	Age, Past Use, Curiosity, Perceived Enjoyment, Price Willing to Pay	Industrial context not specified
(Herz & Rauschnabel, 2019)	Consumer reactions to wearable VR glasses	Virtual Presence, Virtual Embodiment, Fashionability, Wearable Comfort, Utilitarian Benefits, Hedonic Benefits, Health Risks, Physical Risks, Psychological Risks, Privacy Risks	Industrial context not specified
(Guttentag, 2020)	Acceptance of VR as a substitute for real tourism	Demographics, Psychographics, Tech attitudes, VR familiarity, Expertise, Motivations, Constraints, Accessibility Sensatory focus, Activeness Duration, Presence, Vividness, Interactivity Accuracy	Leisure and Travel
(Sagnier et al., 2020)	Acceptance of VR technology by combining elements of the acceptance model and user experience	Pragmatic and Hedonic Quality Simulation, Personal Innovativeness, Cybersickness, Presence	Industrial context not specified
(Fussell & Truong, 2021)	Factors influencing the use of VR applications in a pedagogical environment	Performance Expectancy, Perceived Enjoyment, Perceived Health Risk, Regulatory Uncertainty, Self-Efficacy, Perceived Behavioural Control	Education and Learning

should be explored in such a way to ensure applicability for a chosen context (tom Dieck, tom Dieck, 2018).

Acceptance of VR Technology by PwDs for tourism is complex as it is an interconnection between acceptance of VR as a technology and as an alternative form of tourism. Therefore, we propose a more specific view of the characteristics of PwDs through a developed framework to generate new indicators for evaluating the acceptance of VR technology for tourism-related activities. The first stage of the framework as shown in Figure 1 addresses the antecedents of VR Engagement for PwDs. Several external dimensions affect the acceptance of VR technology in PwDs. This section elaborates on disability-specific external variables for VR engagement. These factors are underpinned by leisure constraint theory and divided into interpersonal, intrapersonal and structural factors. The second stage deals with VR engagement and technology acceptance in the light of the VR engagement model (Hollebeek et al., 2020). Cognitive, emotional, behavioural and social are four forms of VR engagement considered in this research as shown in Table 2.

Intrapersonal factors

Intrapersonal factors encompass a person's 'psychological state, physical functioning and cognitive abilities' (Orakani, 2020, p.34). These can include stress, anxiety, lack of interest, perceived abilities, perceived relevance and accessibility of tourism activities. Four main intrapersonal factors have been identified which may affect the perceived usefulness and perceived ease of use of virtual technology tourism for PwDs. These are a) type of disability, b) the intensity of disability, c) pain in use and d) generalised anxiety.

Table 2. Forms of VR Engagement.

Forms of VR Engagement	Definition	Example
Cognitive	Cognitive VR engagement relates to active mental state and thoughts (cognitive investments) in the VR application experienced by the user. (Hollebeek et al., 2020; Violante et al., 2019)	Spending time thinking about the VR applications, finding the VR application interesting.
Emotional	Emotional VR engagement reflects emotions experienced by the user such as enjoyment, intimacy, and depth of the connection with the VR application. (Hollebeek et al., 2020; Violante et al., 2019)	Feeling pleasure while using the VR applications. Using VR application as a treat to oneself.
Behavioural	Behavioural engagement is the manifestation of focus on the VR applications in terms of involvement (time spent), effort and energy levels etc. (Violante et al., 2019)	Putting effort to use the VR application such as getting help from others.
Social	Social VR engagement captures the social investment of the user reflected in sharing the VR application with friends/colleagues, helping users in using VR applications etc. (Hollebeek et al., 2020)	Using the VR application with a friend, promoting the VR application to friends.

Types of disability

It is common for all the PwDs to be considered as a specific group encountering similar restraints that can be tackled by providing solutions applicable to the whole group (McKercher & Darcy, 2018). But treating different types of disability similarly can often be misleading as what might be a critical issue for a PwD with one type of disability, may not be relevant to another PwD. Studies on the motivation of PwDs in the context of leisure and tourism such as Adam et al. (2017) show that the motivation to engage in leisure varies by type of disability. Disability is typically categorised into four dimensions i.e. mobility, sensory, communication and intellectual. These four groups have unique needs and demands in the acceptance of VR as an alternative form of tourism. For example, structural design factors are more significant for PwDs with mobility issues. They might not be able to experience the full extent of the tourist destination because of structural issues in the design of paths. Conversely, structural design solutions are of little consequence to people with sensory (hearing) impairments. However, they will need alternative communication options and technologies (e.g. captioning) to fully enjoy the experiences (McKercher & Darcy, 2018).

Intensity of disability

The perceived 'intensity' of an individual's disability in their daily life can impact their attitudes in relation to an alternative tourism opportunity. How an individual responds and adapts to a disability varies and the intensity of the response impacts the anxiety experienced by PwDs during travel or other leisure activities (Bennett et al., 2019). Perceptions of disability also affect how a person sees and interacts with the outside environment. PwDs who consider their disabilities as significantly impeding travel and leisure activities might positively incline towards an alternative form of tourism using VR technology (Bennett et al., 2019).

Pain in use

PwDs mostly battle with persistent and undesired conditions for a large span of time, which are enhanced by the use of certain technologies and mediums (Beudaert et al., 2017). For instance, when exposed to overloading stimuli. PwDs are most susceptible to pain because of their conditions, and it may affect the use of VR as well as accepting VR as an alternative form of tourism because of the pain experienced during physical travel.

Generalised anxiety

Generalised anxiety is described as 'the condition which causes a person to feel anxious about a wide range of situations and issues, rather than one specific event' (Bennett et al., 2019, p.4). Stress and disorientation are typically accompanied by generalised anxiety. Generalised anxiety is especially

common among people with accidental injuries leading to disability and dependence upon others (Antunes et al., 2018). Fear caused by generalised anxiety may become extreme and irrational, leading to an adverse effect on normal daily activities. Anxiety in trying out and using a new type of technology and distrust of the safety of the new technology are more likely in PwDs with generalised anxiety, implying that PwDs who experience highly-generalised anxiety might have negative attitudes towards trying a new technology such as VR.

Effect of intrapersonal factors on VR engagement

Intrapersonal factors such as the level of disability, type of disability and pain in use affect behavioural VR engagement. Behavioural engagement is manifested through the amount of effort, and time spent interacting with VR. Certain characteristics of PwDs associated directly with the level and type of disability as well as pain in use, making it difficult for people to engage with new technologies. However, previous studies have shown that self-reported levels of disability have been associated negatively with the usage behaviour of new technologies (Chen & Chan, 2014). People with higher levels of disability might engage with more VR-based travel, especially when corporations are striving to lower their carbon footprint. Another important intrapersonal factor for PwDs is generalised anxiety. PwDs exhibit a higher level of anxiety compared to the average (Bennett et al., 2019). It can have a direct impact on cognitive engagement as VR-based tourism is manifested through the VR device and reflective thought processing and how the users relate the VR interaction with other information and memories is key to enjoying virtual travel.

Based on the above, we propose

Proposition 1a: *Type of disability, the intensity of disability, pain in use and generalised anxiety are the intrapersonal factors that affect the engagement of PwDs with VR-based tourism.*

Proposition 1b: *Intrapersonal factors affect the cognitive, behavioural, and emotional engagement of PwDs with VR-based tourism products.*

Interpersonal factors

The interpersonal category includes constraints that are an outcome of relationships with others. These constraints arise due to/lack of social interactions and relationships among people. Interpersonal constraints influence leisure preferences and participation (Orakani, 2020).

Physical dependency

PwDs are mostly dependent on friends/family for travel-related activities. For example, people with mobility impairments require substantial help to even move around in their own place. Physical dependency upon others is mostly an implication for PwDs, especially ones with mobility disabilities. One example can be getting assistance for using VR hardware (Blichfeldt & Nicolaisen, 2011; Orakani, 2020). Depending on the severity of the disability, the use of VR may only be possible with the assistance of a friend, caregiver, etc. Likewise, depending on the type of disability, the physical risk could also increase for PwDs as, there is a possibility of self-injury while using VR technology (Herz & Rauschnabel, 2019).

Psychological dependency

PwDs also develop a psychological dependency on others, which may or may not depend on the severity of the disability. It acts as a constraint that in most cases is even stronger than physical dependency (Orakani, 2020). It restricts PwDs to develop certain skills including personal initiative, creative thinking and risk-taking (Smith, 1987). These qualities have been associated with the use of new technologies and hence might be needed to adopt VR travel.

Being exposed to a virtual world might enhance the psychological problems faced by PwDs (Herz & Rauschnabel, 2019).

Effect of interpersonal factors on VR engagement

A disabled user's physical and psychological dependency drives social engagement during VR travel and is reflected in the social investment of their VR interactions. It can be in the form of enjoying VR-driven travel with other users such as friends, as VR devices allow geographically dispersed individuals to interact virtually and engage socially (Itani & Hollebeek, 2021). Hence it is proposed:

Proposition 2a: *Physical dependency and psychological dependency are the interpersonal factors that affect the engagement of PwDs with VR-based tourism.*

Proposition 2b: *Interpersonal factors affect the social engagement of PwDs with VR-based tourism products.*

Structural factors

Structural factors are the most distal of the three types of constraint factors and are attributed to environment, access, the physical nature of an area or the context of activities (Crawford & Godbey, 1987). Different research studies confirm that many PwDs report structural factors as one of the key barriers that prevent their participation in leisure activities (Orakani, 2020). One of these structural factors relates to equipment, which is fundamental to VR-based travel products.

Design choices

Once inside a leisure or travel setting, PwDs come across challenges because of their design choices. In a normal physical retail setting, Beudaert et al. (2017) identified some design attributes that exclude or restrict PwDs from using a service. These attributes include confined space, product infringement, aisle with narrow width, writing with small font size, distorted colours and music. In a VR setting, some of these physical components can influence engagement with VR for PwDs. For example, while using a VR headset, the disabled tourist might want to access information, and if this information is not present in a way that can be accessed easily by the person with a disability, it would affect the experience and may even exclude the person from experiencing virtual tourism.

Information quality

The dissemination of accessibility information is a significant factor for PwDs when it comes to activities related to tourism. Most PwDs cannot travel to their desired destination due to a lack of reliable information (McKercher & Darcy, 2018; Orakani, 2020). The use of VR for tourism-related activities can be expected to follow the same pattern unless the accessibility information is factored into the design of VR applications. The difficulties for PwDs in retrieving information concerning travel activities have been highlighted in multiple studies (Eichhorn et al., 2008; Tecau et al., 2019). The extant literature verifies that PwDs whilst travelling are frequently given false and inappropriate information as the customer service employees are generally not trained and provided the required knowledge to assist PwDs (Poria et al., 2010).

Experienced realism

An authentic VR experience should provide positive detachment from physical reality and remove the user from the real world by providing a complete immersion (tom Dieck, tom Dieck, 2018). Noise-cancelling technologies or a quiet location with minimum distractions are some other environmental factors that can be used to enhance experienced realism for normal users.

However, for PwDs, environmental additions may need to be provided based on particular requirements. An experienced realism increase is expected to improve the acceptance of VR-based travel products. The experience of realism can stimulate the senses and positively contribute to a fully immersive experience.

Effect of structural factors on VR engagement

Design choices affect the behavioural engagement of PwDs, which is manifested in terms of time and energy devoted to the use of VR-based travel products. Experienced realism drives emotional engagement and constitutes one of the main reasons for leisure travel, reflecting the joy of consumers while interacting with VR. PwDs heavily rely on available information related to accessibility for different types of disabilities, and the quality of this information affects cognitive engagement with VR-based travel products.

Based on the above, we propose

Proposition 3a: *Structural factors affect the cognitive, behavioural, and emotional engagement of PwDs with VR-based tourism products.*

Proposition 3b: *Design choices, information quality and experienced realism are the structural factors that affect the engagement of PwDs with VR-based tourism.*

Effect of VR constraint factors on VR acceptance

Differences in user personality and cognitive style, characteristics of the technology and task impact perceived usefulness and perceived ease of use of VR (Chen & Chan, 2014). The acceptance of VR as a tourism alternative or as complementary to traditional tourism is mainly contingent upon the receptivity of the individual tourist (Guttentag, 2010). The factors influencing perceived usefulness and perceived ease of use can vary significantly between different segments and groups. For example, many older people view technology positively, yet they do not exhibit the same behaviour as the young towards the acceptance of many new technologies. Technology-related behaviour is different for PwDs compared to those without disabilities and the factors that influence the acceptance (external variables) may also be different. For PwDs in the context of virtual tourism, leisure constraint factors (i.e. interpersonal, intrapersonal, and structural) are the external variables that may impact the perceived ease of use and usefulness of VR-based tourism products.

Intrapersonal factors would influence perceived ease of use in VR-based products because, for other interactive technologies, users who rate their ability to use the technology as high have been shown to perceive that less effort is required to use it (Scott & Walczak, 2009). On the other hand, because of the varying interpersonal factors, the usefulness of virtual travel is different for PwDs. Those who find more constraints in physical travel would find virtual travel more useful. Thus, intrapersonal factors influence the perceived usefulness of VR-based tourism products for PwDs. Interpersonal factors would also influence perceived ease of use and usefulness, as the physical dependency and psychological dependency for travelling to physical locations increases the usefulness of virtual tourism-based products. The perceived ease of use is influenced by the dependence of PwDs while using VR-based products. Structural factors influence the perceived ease of use as the information quality, design choice affects how easy or difficult it will be for the users to experience VR-based tourism products. For other interactive technologies, perceived ease of use is significantly associated with information quality (Tahat et al., 2022). Given that information quality is a subset of structural factors and other structural factors have a similar influence on PwDs, structural factors could likely influence perceived ease of use.

Based on the above, we propose the following

Proposition 4a: *Interpersonal and intrapersonal factors affect the perceived usefulness and perceived ease of use of VR-based tourism products for PwDs.*

Proposition 4b: *Structural factors affect the perceived ease of use of VR-based tourism products for PwDs.*

Effect of VR engagement on VR acceptance

The attitude towards the usage of VR tourism is influenced by the different types of engagement it can facilitate (Scott & Walczak, 2009). For interactive technologies such as VR, potential engagement is vital to the acceptance of technology by PwDs. Iatraki et al. (2021) found that in using VR for learning, students with disabilities preferred engaging content to scientifically aligned content. It can be assumed that for VR-based travel, PwDs would show a positive attitude towards usage when they experience engagement. VR engagement encompasses four different dimensions. These are behavioural, social, cognitive and emotional engagement. Several studies (e.g. Scott & Walczak, 2009; Werner et al., 2011; Hollebeek et al., 2020) have identified behavioural and cognitive engagements as positive predictors of usage behaviour. Behavioural engagement is manifested through the amount of effort and time spent interacting with VR. The amount of effort is related to the perceived ease of use, and the time spent interacting is related to perceived usefulness. Social engagement triggered by VR-based travel products influences the usefulness of the product for PwDs as they generally experience a high rate of social isolation.

The role of cognitive and emotional engagement can play a significant role in determining the potential tourists' behavioural intentions and motivation. Navigation of the virtual environment can induce positive emotional and cognitive engagements that can result in positive effects on behavioural intentions to use VR-based tourism products (Pestek & Sarvan, 2020). Cognitive engagement is indicated by intrinsic interest, curiosity and focused attention. The richness of VR stimulates the senses, and hence allows cognitive engagement that is associated with a positive attitude towards technology. Moreover, cognitive engagement influences self-efficacy, which impacts perceived ease of use and perceived usefulness in the context of interactive technologies such as VR (Scott & Walczak, 2009). Given that cognitive engagement triggers positive attitudes and self-efficacy, it is argued that cognitive engagement affects perceived ease of use and perceived usefulness. In the context of VR, *emotional engagement refers to the* enjoyment and emotional involvement in VR-based tourism. Users who are emotionally engaged with the concept of VR-based tourism perceive the technology as easy to use because the strong emotional involvement reduces the perception of the effort required to learn or use the technology-based product.

Based on the above, we propose the following

Proposition 5a: *Cognitive, behavioural, and social engagement affect the perceived usefulness of VR-based tourism products for PwDs.*

Proposition 5b: *Cognitive, emotional, and behavioural engagement affect the perceived ease of use of VR-based tourism products for PwDs.*

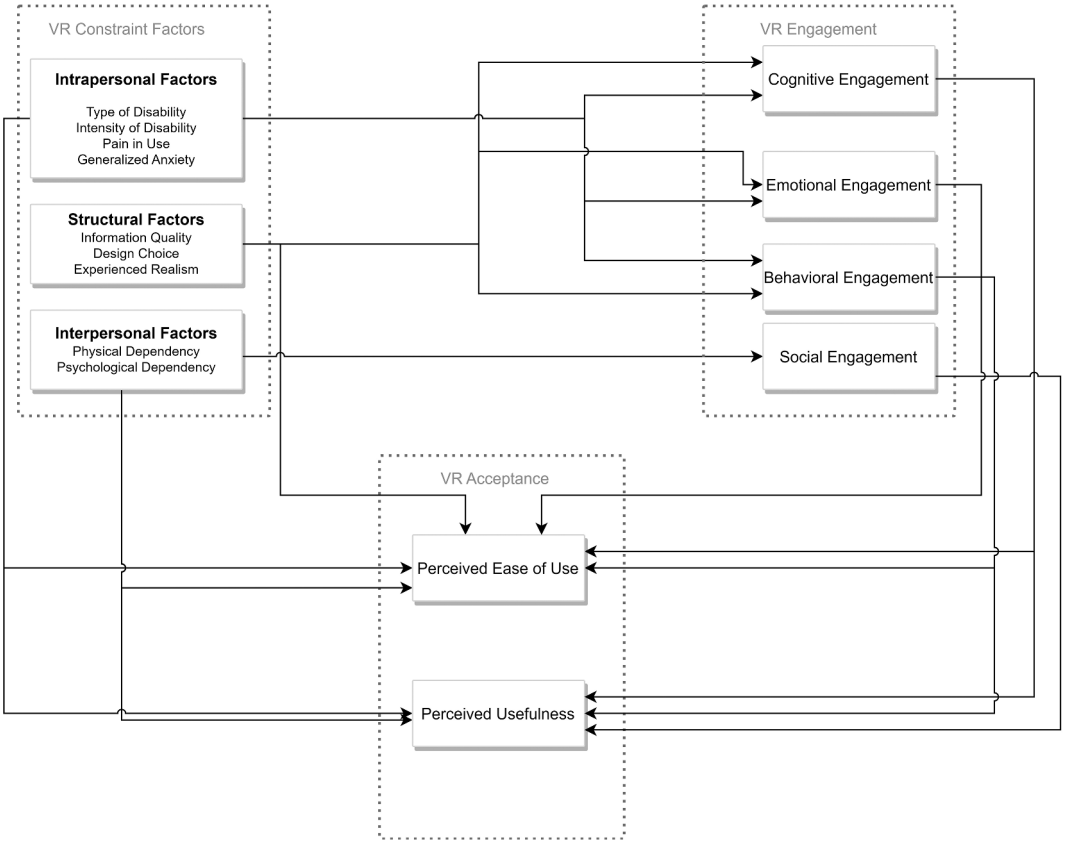

Figure 1. Conceptual model of VR Tourism Acceptance for PwDs.

Discussion and implications

Theoretical implications and further research

This study contributes to the understanding of VR acceptance among PwDs as an alternative form of tourism and offers a springboard for continued empirical research and hence makes an important theoretical contribution in terms of VR usage in tourism. The conceptual framework depicted in Figure 1 can help in improving the awareness of leisure constraints that can impact the adoption of tourism-related technologies in general and VR in particular. We adopt interpersonal, intrapersonal and structural factors as drivers of engagement and acceptance of VR tourism-related products. The three top-level constraints: intrapersonal, interpersonal, and structural are mapped to VR engagement and perceived ease of use and perceived usefulness. The top-level constraints are further subdivided into VR tourism-specific factors. Empirical research on VR tourism can be greatly enhanced by adopting a constraint-based approach for studying technology acceptance in PwDs. The conceptual model presented in this study provides a theoretical understanding of technology acceptance concerning disability, laying the foundation for significant and exciting opportunities that lie ahead at the crossroads of tourism, technology acceptance and disability research. Future endeavours based on this model could lead to a fine-grained understanding of the technology development process for people with disabilities. It also adds to the continuous move towards accessibility and making the environment and technologies accessible for people with a diverse range of abilities.

Future research can bring to light alternate perspectives that may be used to complement our analysis. For instance, intra- and interpersonal factors might also have a moderating effect on VR acceptance. This was not fully investigated in this research and can serve as an area for further exploration. We also propose an in-depth qualitative study to gain insights into how acceptance of VR tourism differs for individuals suffering from different types of disabilities. Research on PwDs tourism inclination can investigate the characteristics of a VR application (e.g. providing an alternative way of communication and limited range of colours) that are preferred by PwDs. It would be fruitful for future research to investigate additional attributes that could contribute towards technology acceptance in establishing a positive outlook for the future of VR for tourists with disabilities. Moreover, there is a need to examine the impact of skills and experience on virtual tourism experiences of PwDs, particularly, the influence of previous experiences with the technology and the levels of participation.

Managerial implications

This work provides multiple implications for designing and marketing tourism-related VR products. First, differences between types of disabilities can be crucial in driving engagement. Managers and decision-makers in the tourism industry need to identify their VR offerings and products suited for a particular group and target their marketing efforts at this group for improved adoption. Policymaking can benefit by designing policies, which are anchored on the provision of virtual reality as an alternate form of tourism, especially in the post-COVID era. For example, to alleviate anxiety about VR among those PwDs who are not tech-savvy, public information campaigns can be used to clarify and demystify different elements related to the use of VR.

Second, while VR engagement and acceptance in PwDs could depend on many factors, VR developers and managers can substantially impact structural factors. For example, the provision of easily accessible disability-related information with VR products may be useful to familiarise disabled consumers with different VR products, particularly for those interested in VR. Moreover, for better engagement with VR products, they should be customised for PwDs with design choices, thereby, making them more usable. In instances where a customised product for people with disabilities cannot be developed, design choices should be made that can make the use of VR easier for PwDs and not affect the price or purpose of the product. One of the ways for VR designers to make all their products easier to use is to follow standards and guidance for inclusive design. One such guidance comes from the Centre for Universal Design, which proposes seven different principles for designing environments, communication and products for people with diverse backgrounds and abilities. These principles include equitable use, flexibility, simplicity and intuitive use, perceptible information, tolerance for error, low physical effort, and adequate size and space for each approach and use (Lyu, 2017).

Third, to ensure the continued use of VR by PwDs, specific features should be regularly evaluated and monitored based on feedback from VR users. To achieve the aim of continued use, VR tourism product providers must develop relevant personalised VR applications that address most concerns of PwDs while providing an engaging and hedonic experience; thereby compelling users to continue interacting with VR applications (Hollebeek et al., 2020).

Conclusion

In this study, a VR acceptance model is developed specifically for PwDs in the tourism context. Based on this model, we propose several propositions to guide further research in this evolving area of enquiry. There is a long way ahead in terms of realising the full potential of VR tourism for PwDs. This research aims to serve as a stepping stone in creating awareness of the needs of individuals with disabilities.

Disclosure statement

No potential conflict of interest was reported by the author(s).

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References

Adam, I., Kumi-Kyereme, A., & Boakye, K. A. (2017). Leisure motivation of people with physical and visual disabilities in Ghana. *Leisure Studies*, *36*(3), 315–328.

Aitchison, C. (2009). Exclusive discourses: Leisure studies and disability. *Leisure Studies*, *28*(4), 375–386. https://doi.org/10.1080/02614360903125096

Antunes, A., Frasquilho, D., Azeredo-Lopes, S., Neto, D., Silva, M., Cardoso, G., & Caldas-de-Almeida, J. M. (2018). Disability and common mental disorders: results from the world mental health survey initiative Portugal. *European Psychiatry*, *49*, 56–61.

Bas, M. (2016). Common constraints of tourism market segments: Examples of senior tourism and disabled tourism. *International Conference on Tourism Dynamics and Trends*, Antalya, Turkey, 54–72.

Beck, J., Rainoldi, M., & Egger, R. (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

Bennett, R., Vijaygopal, R., & Kottasz, R. (2019). Attitudes towards autonomous vehicles among people with physical disabilities. *Transportation Research Part A*, *127*(June), 1–17. https://doi.org/10.1016/j.tra.2019.07.002

Beudaert, A., Gorge, H., & Herbert, M. (2017). An exploration of servicescapes' exclusion and coping strategies of consumers with "hidden" auditory disorders. *Journal of Services Marketing*, *31*(4/5), 326–338. https://doi.org/10.1108/JSM-06-2016-0247

Blichfeldt, B. S., & Nicolaisen, J. (2011). Disabled travel: Not easy, but doable. *Current Issues in Tourism*, *14*(1), 79–102. https://doi.org/10.1080/13683500903370159

Chen, K., & Chan, A. H. S. (2014). Gerontechnology acceptance by elderly Hong Kong Chinese: A senior technology acceptance model (STAM). *Ergonomics*, *57*(5), 635–652. https://doi.org/10.1080/00140139.2014.895855

Choi, C., Greenwell, T. C., Hums, M. A., & Hambrick, M. E. (2019). Understanding consumer behaviors in virtual golf: Differences in leisure constraints. *Sport Marketing Quarterly*, *28*(1), 46–57. https://doi.org/10.32731/SMQ.281.032019.04

Chung, N., Han, H., & Joun, Y. (2015). Tourists' intention to visit a destination: The role of augmented reality (AR) application for a heritage site. *Computers in Human Behavior*, *50*, 588–599. https://doi.org/10.1016/j.chb.2015.02.068

Condie, G. A. (2021). Exploring the personal and social aspects of individuals with physical disabilities' Leisure experiences: Experiencing leisure but as an individual person. *Leisure Studies*, *40*(3), 363–377. https://doi.org/10.1080/02614367.2020.1843691

Crawford, D. W., & Godbey, G. (1987). Reconceptualizing barriers to family leisure. *Leisure Sciences*, *9*(2), 119–127. https://doi.org/10.1080/01490408709512151
Crawford, D. W., Jackson, E. L., & Godbey, G. (1991). A hierarchical model of leisure constraints. *Leisure Sciences*, *13* (4), 309–320. https://doi.org/10.1080/01490409109513147
Darcy, S. (2002). Marginalised participation: Physical disability, high support needs and tourism. *Journal of Hospitality and Tourism Management*, *9*(1), 61–73.
Darcy, S., & Buhalis, D. (2011). Introduction: From disabled tourists to accessible tourism. *Accessible Tourism: Concepts and Issues*, 1–20.
Darcy, S., & Pegg, S. (2011). Towards strategic intent: Perceptions of disability service provision amongst hotel accommodation managers. *International Journal of Hospitality Management*, *30*(2), 468–476. https://doi.org/10.1016/j.ijhm.2010.09.009
Daruwalla, P., & Darcy, S. (2005). Personal and societal attitudes to disability. *Annals of Tourism Research*, *32*(3), 549–570. https://doi.org/10.1016/j.annals.2004.10.008
Davis, F. 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
Dick, E. (2021). *Current and potential uses of AR/VR for equity and inclusion*.
Disztinger, P., Schlögl, S., & Groth, A. (2017). Technology acceptance of virtual reality for travel planning. In Schegg, R., & Stangl, B. (Eds.), *Information and communication technologies in tourism 2017* (pp. 255–268). Cham: Springer.
Du, J., Floyd, C., Kim, A. C. H., Baker, B. J., Sato, M., James, J. D., & Funk, D. C. (2021). To be or not to be: Negotiating leisure constraints with technology and data analytics amid the COVID-19 pandemic. *Leisure Studies*, *40*(4), 561–574. https://doi.org/10.1080/02614367.2020.1862284
Eichhorn, V., Miller, G., Michopoulou, E., & Buhalis, D. (2008). Enabling access to tourism through information schemes? *Annals of Tourism Research*, *35*(1), 189–210. https://doi.org/10.1016/j.annals.2007.07.005
EUROSTAT. (2020). *Government expenditure on social protection - Statistics Explained*. https://ec.europa.eu/eurostat/statistics-explained/index.php/Government_expenditure_on_social_protection
Fishbein, M., & Ajzen, I. (1975). *Belief, attitude, intention, and behavior: An introduction to theory and research*. Addison-Wesley.
Ford, P. J. (2001). Paralysis lost: Impacts of virtual worlds on those with paralysis. *Social Theory and Practice*, *27*(4), 661–680. https://doi.org/10.5840/soctheorpract200127435
Freeman, I., & Selmi, N. (2010). French versus Canadian tourism: Response to the disabled. *Journal of Travel Research*, *49*(4), 471–485. https://doi.org/10.1177/0047287509349268
Fussell, S. G., & Truong, D. (2021). Using virtual reality for dynamic learning: An extended technology acceptance model. *Virtual Reality*, 1–19.
Gersdorf, C., & Mayer, S. (2006). *Nature in literary and cultural studies: Transatlantic conversations on ecocriticism* (Vol. 3). Amsterdam, Netherlands: Rodopi.
Godbey, G., Crawford, D. W., & Shen, X. S. (2010). Assessing hierarchical leisure constraints theory after two decades. *Journal of Leisure Research*, *42*(1), 111–134. https://doi.org/10.1080/00222216.2010.11950197
Guttentag, D. 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
Guttentag, D. (2020). Virtual Reality and the End of Tourism? A Substitution Acceptance Model. In Xiang, Z., Fuchs, M., Gretzel, U., & Höpken, W. (Eds.), *Handbook of e-Tourism*. Cham: Springer https://doi.org/10.1007/978-3-030-05324-6_113-1.
Herz, M., & Rauschnabel, P. A. (2019). Understanding the diffusion of virtual reality glasses: The role of media, fashion and technology. *Technological Forecasting and Social Change*, *138*, 228–242. https://doi.org/10.1016/j.techfore.2018.09.008
Hollebeek, L. D., Clark, M. K., Andreassen, T. W., Sigurdsson, V., & Smith, D. (2020). Virtual reality through the customer journey: Framework and propositions. *Journal of Retailing and Consumer Services*, *55*, 102056. https://doi.org/10.1016/j.jretconser.2020.102056
Holsapple, C. W., & Wu, J. (2007). User acceptance of virtual worlds: The hedonic framework. *ACM SIGMIS Database: The DATABASE for Advances in Information Systems*, *38*(4), 86–89. https://doi.org/10.1145/1314234.1314250
Huang, Y. C., Backman, K. F., Backman, S. J., & Chang, L. L. (2016). Exploring the implications of virtual reality technology in tourism marketing: An integrated research framework. *International Journal of Tourism Research*, *18*(2), 116–128. https://doi.org/10.1002/jtr.2038
Huang, Y. C., Backman, S. J., Backman, K. F., & Moore, D. (2013). Exploring user acceptance of 3D virtual worlds in travel and tourism marketing. *Tourism Management*, *36*, 490–501. https://doi.org/10.1016/j.tourman.2012.09.009
Huh, C., & Singh, A. J. (2007). Families travelling with a disabled member: Analysing the potential of an emerging niche market segment. *Tourism and Hospitality Research*, *7*(3–4), 212–229. https://doi.org/10.1057/palgrave.thr.6050044

Iatraki, G., Delimitros, M., Vrellis, I., & Mikropoulos, T. A. (2021). Augmented and virtual environments for students with intellectual disability: Design issues in science education. *2021 International Conference on Advanced Learning Technologies (ICALT)*, Tartu, Estonia, 381–385.

IDC. (2022). *AR/VR Headset Shipments Grew Dramatically in 2021, Thanks Largely to Meta's Strong Quest 2 Volumes, with Growth Forecast to Continue*. https://www.idc.com/getdoc.jsp?containerId=prUS48969722

Itani, O. S., & Hollebeek, L. D. (2021). Light at the end of the tunnel: Visitors' virtual reality (versus in-person) attraction site tour-related behavioral intentions during and post-COVID-19. *Tourism Management*, *84*, 104290. https://doi.org/10.1016/j.tourman.2021.104290

Lee, J., Kim, J., & Choi, J. Y. (2019). The adoption of virtual reality devices: The technology acceptance model integrating enjoyment, social interaction, and strength of the social ties. *Telematics and Informatics*, *39*, 37–48. https://doi.org/10.1016/j.tele.2018.12.006

Loureiro, S. M. C., Guerreiro, J., & Ali, F. (2020). 20 years of research on virtual reality and augmented reality in tourism context: A text-mining approach. *Tourism Management*, *77*, 104028. November 2019. https://doi.org/10.1016/j.tourman.2019.104028

Lyu, S. O. (2017). Which accessible travel products are people with disabilities willing to pay more? A choice experiment. *Tourism Management*, *59*, 404–412. https://doi.org/10.1016/j.tourman.2016.09.002

Manis, K. T., & Choi, D. (2019). The virtual reality hardware acceptance model (VR-HAM): Extending and individuating the technology acceptance model (TAM) for virtual reality hardware. *Journal of Business Research*, *100*, 503–513. https://doi.org/10.1016/j.jbusres.2018.10.021

Maran, P. L., Daniëls, R., & Slegers, K. (2022). The use of extended reality (XR) for people with moderate to severe intellectual disabilities (ID): A scoping review. *Technology and Disability*, *34*(2), 53–67. https://doi.org/10.3233/TAD-210363

Mascho, E., & Singh, N. (2014). Virtual tourism: Use of "second life" for destination marketing. *Anatolia*, *25*(1), 140–143. https://doi.org/10.1080/13032917.2013.815644

McKercher, B., & Darcy, S. (2018). Re-conceptualizing barriers to travel by people with disabilities. *Tourism Management Perspectives*, *26*, 59–66. https://doi.org/10.1016/j.tmp.2018.01.003

Michopoulou, E., & Buhalis, D. (2013). Information provision for challenging markets: The case of the accessibility requiring market in the context of tourism. *Information & Management*, *50*(5), 229–239. https://doi.org/10.1016/j.im.2013.04.001

Mura, P., Tavakoli, R., & Sharif, S. P. (2017). 'Authentic but not too much': Exploring perceptions of authenticity of virtual tourism. *Information Technology & Tourism*, *17*(2), 145–159. https://doi.org/10.1007/s40558-016-0059-y

Mütterlein, J., & Hess, T. (2017). Immersion, presence, interactivity: towards a joint understanding of factors influencing virtual reality acceptance and use. *Twenty-Third Americas Conference on Information Systems*, Boston, MA.

Orakani, S. N. (2020). *From constraints to participation: A study of the behaviour of New Zealand travellers with mobility impairments*. [Victoria University of Wellington]. http://hdl.handle.net/10063/8562

Orton-Johnson, K. (2014). Knit, purl and upload: New technologies, digital mediations and the experience of leisure. *Leisure Studies*, *33*(3), 305–321. https://doi.org/10.1080/02614367.2012.723730

Pantano, E., & Corvello, V. (2014). Tourists' acceptance of advanced technology-based innovations for promoting arts and culture. *International Journal of Technology Management*, *64*(1), 3–16. https://doi.org/10.1504/IJTM.2014.059232

Pencarelli, T. (2020). The digital revolution in the travel and tourism industry. *Information Technology and Tourism*, *22*(3), 455–476. https://doi.org/10.1007/s40558-019-00160-3

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

Perry Hobson, J. S., & Williams, P. (1997). Virtual reality: The future of leisure and tourism? *World Leisure & Recreation*, *39*(3), 34–40. https://doi.org/10.1080/10261133.1997.9674077

Pestek, A., & Sarvan, M. (2020). Virtual reality and modern tourism. *Journal of Tourism Futures*, *7*, 245–250. https://doi.org/10.1108/JTF-01-2020-0004

Poria, Y., Reichel, A., & Brandt, Y. (2010). The flight experiences of people with disabilities: an exploratory study. *Journal of Travel Research*, *49*(2), 216–227.

Rasul, T. (2021). Adoption intention of virtual reality in choosing travel destinations in the context of a developing economy. *Tourism Recreation Research*, *0*(0), 1–5. https://doi.org/10.1080/02508281.2021.1981073

Rauschnabel, P. A., Felix, R., Hinsch, C., Shahab, H., & Alt, F. (2022). What is XR? Towards a framework for augmented and virtual reality. *Computers in Human Behavior*, *133*, 107289. https://doi.org/10.1016/j.chb.2022.107289

Sagnier, C., Loup-Escande, E., Lourdeaux, D., Thouvenin, I., & Valléry, G. (2020). User acceptance of virtual reality: An extended technology acceptance model. *International Journal of Human–Computer Interaction*, *36*(11), 993–1007. https://doi.org/10.1080/10447318.2019.1708612

Scott, J. E., & Walczak, S. (2009). Cognitive engagement with a multimedia ERP training tool: Assessing computer self-efficacy and technology acceptance. *Information & Management*, *46*(4), 221–232. https://doi.org/10.1016/j.im.2008.10.003

Shaw, G., Church, A., & Coles, T. (2007). Disability legislation and empowerment of tourists with disabilities in the United Kingdom. *Tourism, Power and Space*, 83–100.

Singh, R., Sibi, P. S., Yost, E., & Mann, D. S. (2021). Tourism and disability: A bibliometric review. *Tourism Recreation Research*, *0*(0), 1–17. https://doi.org/10.1080/02508281.2021.1959768

Smith, R. W. (1987). Leisure of disable tourists. Barriers to participation. *Annals of Tourism Research*, *14*(3), 376–389. https://doi.org/10.1016/0160-7383(87)90109-5

Standen, P. J., & Brown, D. J. (2005). Virtual reality in the rehabilitation of people with intellectual disabilities. *Cyberpsychology & Behavior*, *8*(3), 272–282. https://doi.org/10.1089/cpb.2005.8.272

Tahat, K. M., Al-Sarayrah, W., Salloum, S. A., Habes, M., & Ali, S. (2022). The influence of YouTube videos on the learning experience of disabled people during the COVID-19 outbreak. In Hassanien, A-E., Elghamrawy, S. M., & Zelinka, I. (Eds.), *Advances in data science and intelligent data communication technologies for COVID-19* (pp. 239–252). Springer.

Tavakoli, R., & Mura, P. (2015). 'Journeys in second life'–Iranian Muslim women's behaviour in virtual tourist destinations. *Tourism Management*, *46*, 398–407. https://doi.org/10.1016/j.tourman.2014.07.015

Tecau, A. S., Bratucu, G., Tescaşiu, B., Chiţu, I. B., Constantin, C. P., & Foris, D. (2019). Responsible tourism-integrating families with disabled children in tourist destinations. *Sustainability (Switzerland)*, *11*(16), 1–18. https://doi.org/10.3390/su11164420

Tom Dieck, M. C., & Jung, T. (2018). A theoretical model of mobile augmented reality acceptance in urban heritage tourism. *Current Issues in Tourism*, *21*(2), 154–174. https://doi.org/10.1080/13683500.2015.1070801

Tom Dieck, D., Tom Dieck, M. C., Jung, T., & Moorhouse, N. (2018). Tourists' virtual reality adoption: An exploratory study from Lake District National Park. *Leisure Studies*, *37*(4), 371–383. https://doi.org/10.1080/02614367.2018.1466905

United Nations. (2006). *THE CONVENTION ON THE RIGHTS OF PERSONS WITH DISABILITIES*. https://www.ohchr.org/Documents/Publications/CRPD_TrainingGuide_PTS19_ENAccessible.pdf

Venkatesh, V., Morris, M. G., Davis, G. B., & Davis, F. D. (2003). User acceptance of information technology: Toward a unified view. *MIS Quarterly*, *27*(3), 425–478. https://doi.org/10.2307/30036540

Violante, M. G., Vezzetti, E., & Piazzolla, P. (2019). How to design a virtual reality experience that impacts the consumer engagement: The case of the virtual supermarket. *International Journal on Interactive Design and Manufacturing (IJIDeM)*, *13*(1), 243–262. https://doi.org/10.1007/s12008-018-00528-5

Werner, J. M., Carlson, M., Jordan-Marsh, M., & Clark, F. (2011). Predictors of computer use in community-dwelling, ethnically diverse older adults. *Human Factors*, *53*(5), 431–447.

World Health Organization. (2015) . *WHO global disability action plan 2014-2021: Better health for all people with disability*. World Health Organization.

Wyld, D. C. (2010). The virtual tourist: Using the virtual world to promote the real one. *Advances in Competitiveness Research*, *18*(1–2), 111–121.

Xi, N., & Hamari, J. (2021). Shopping in virtual reality: A literature review and future agenda. *Journal of Business Research*, *134*, 37–58. https://doi.org/10.1016/j.jbusres.2021.04.075

Yau, M. K., McKercher, B., & Packer, T. L. (2004). Traveling with a disability: More than an access issue. *Annals of Tourism Research*, *31*(4), 946–960. https://doi.org/10.1016/j.annals.2004.03.007