Evaluating User Engagement via Metaverse Environment through Immersive Experience for Travel and Tourism Websites

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ABSTRACT

In a world where the internet is a primary source of travel inspiration, information, and bookings, the competition for users' attention and interaction is fierce. As travellers increasingly turn to digital platforms to plan their journeys, the user experience and engagement provided by tourism websites has never been more critical. The purpose of this research is to improve the user engagement in the Metaverse environment along with the pivotal role of immersive experience within the Metaverse. Additionally, we investigate how the mediating effects of hedonic and utilitarian values influence the connection between immersive experiences and user engagement. Furthermore, how user perception such as headset comfortability, simulation sickness, prior knowledge and ease of use moderate the relationship between immersive experience and the use Metaverse. Through this study, we aim to uncover the nuances that shape virtual travel at a pre-experience stage, contributing to a deeper understanding of how the Metaverse revolutionises user engagement within the evolving landscape of hospitality and tourism. This study employed a triangulation methodology containing Systematic Literature Review (SLR), Interviews and Survey to gain a more comprehensive insight into the research objective. 25 interviews were conducted from Metaverse users. The survey was collected from 118 users online. The results from Structural Equation Modelling (SEM) revealed that the utilization of Metaverse leads to positive

immersive experience which in turn impacts user engagement positively. Moreover, user perception moderates the relation between immersive experience and Metaverse, whereas hedonic and utilitarian values mediate the relationship between immersive experience and user engagement. This research brings substantial value to the existing literature by addressing the pressing need for a deeper understanding of user engagement in the context of the Metaverse and immersive experiences, which is increasingly relevant in an era dominated by online travel planning.

Keywords: Metaverse, Immersive Experience, User Engagement, User Perception, Hedonic Value, Utilitarian Value, TAM, Perceived ease of use, Perceived usefulness

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INTRODUCTION

Many tourism websites are grappling today with stagnating user engagement rates that hinder their ability to capitalize on the opportunities presented by the digital landscape. Current literature on engaging visitors on a website highlights the influence of hedonic and utilitarian motivational aspects used by the website to engage users of services offered (Bilgihan et al, 2015; Ongsakul et al. 2021) Despite the usefulness and value these platforms offer as hedonic and utilitarian, engaging users who visit these websites remains a challenge for them (Chen et al., 2022). Scholarly studies such as Katsoni (2013) have discussed lack of personalisation as one of the reasons behind inability of websites to engage users, whereas other research scholars such as Tan (2019) have highlighted the issue of information overload for users combined with limited interactive features available on the platform as reasons for limited user engagement. Many researchers have discussed personalisation for user engagement in the context of using technology for marketing (Lehmann et al. 2012; Garett et al. 2016 and O'Brien et al 2018). These scholars have not considered personalisation of services they offer by integrating metaverse as a virtual reality tool into their website, for both utilitarian and hedonic value explained through an immersive experience.

Dassault Systèmes, a European multinational company, conducted a study of 3000 consumers in China, France and USA in 2020, to understand future needs of the users of web-based platforms. Their findings explained that users are willing to share information and also pay a premium for information if provided in a personalised manner (Velizy-Villacoublay, 2020). This study reported that businesses can have better opportunities if they integrate personalization tools within their websites. As per the report, users are looking for an exclusive and personalised online experience that is tailored to their likings and tastes when there is

plethora of options available to them from competing and/or non-competing platforms such as AirBnB. Therefore, personalisation emerges as an evaluating feature for users of web-based platforms offering services in an online space (Sharma et al, 2004; Meddeb et al. 2021). Web-based platforms when offer personalisation with relevant information, they empower users to make informed choices with a logical reasoning (Buhalis et al, 2015; Lemon et al, 2016).

The integration of the metaverse as a virtual reality (VR) tool for personalized services on travel websites represents a paradigm shift in user engagement. The Metaverse distinguishes itself from conventional technologies like websites and mobile applications. Unlike these traditional technologies that offer static images or videos, the metaverse provides a depth of immersion and personalization. Users can experience interactive and dynamic content, a feature lacking in static platforms. This distinction becomes crucial in addressing the challenge of user engagement on tourism websites. While existing literature emphasizes the importance of personalization in engaging users, the focus has primarily been on these traditional technologies. Our study fills a critical gap by exploring the novel application of TAM to metaverse technology, offering a more immersive and personalized online experience which will be able to increase user engagement. This research not only explored direct relationships between constructs but also delved into the intricacies of moderation and mediation effects. In this research, user perception serves as a crucial moderator, influencing the strength and nature of relationships between metaverse use and immersive experience. Furthermore, hedonic and utilitarian values are examined as mediators, unravelling the nuanced mechanisms through which they shape user engagement dynamics. The research focuses on the hedonic and utilitarian value offered by encouraging users to virtually immerse themselves into the real world using metaverse at the pre-experience stage of their journey planning phase. With this lens, this research will investigate what will make visiting users get hooked to a website that will offer use of virtual reality to research about experience they will get from essential

intangible products such as hotels, with other related information (Gursoy et al., 2010; Gursoy & McCleary, 2004; Mohammed & Al-Swidi, 2019). Authors conceptualise a framework to understand different facets of adoption of virtual reality with an approach of *'look before you book'* and gain experience about the location as in a real environment (Binkhorst, 2013; Kim & Hardin, 2010; Tussyadiah et al., 2018). To fill this gap, a systematic review of the relevant literature followed by interviews with experts were respectively helpful in exploring and refining the relationships conceptualized with a purpose to establish the means for web-based platforms to increase engagement of users of their offerings. Therefore, this leads to our research question.

How do users perceive the ease of using metaverse technology and its overall usefulness in planning and experiencing virtual travel through the Immersive Experience, thus increasing User Engagement, when adapting TAM to the Metaverse context?

Following sections of this paper are divided into mainly three main parts. First part presents a review of the available knowledge on the topic under investigation. The review of literature explicitly highlighting the gap in our current understanding. This research tries to fill the gap identified by first analysing the literature. The review of literature helped to explore the relationships further with expert insights gained through qualitative research, which resulted in coneptualisation of a research model and the relationships conceptualized were subjected to empirical testing. The next section presents the justification of the methodology chosen and discusses the data collection, sampling and testing methods followed to test the model with results of the investigation. The third section presents an analysis and discussion around the findings of the study followed by implications of the study for both academics and practitioners with limitations of the study combined with recommendations for future research.

LITERATURE REVIEW AND HYPOTHESIS DEVELOPMENT

The evolution of various platforms that cater to needs of travellers during the digital era have revolutionized the way people not only interact and communicate, but also how they explore and experience the world around them (Rogers, 2019). This transformation is being led by tourism websites such as Expedia and booking.com, which have played a crucial role in overall travel experiences of their users by facilitating travel planning, accommodation bookings etc. (Gossling et al, 2015; Almeida-Santana et al. 2020). Travellers frequently use travel booking websites that offer information with exposure to possible new experiences (Xiang et al, 2010; Riley et al, 1992; Nicoli et al, 2017). A study conducted by Cheung et al. (2011) explained user engagement in the context of digital platforms as a critical measure of the depth of information-based connection between users and online platforms.

Theoretical Framework - Technology Acceptance Model (TAM)

Many scholars have applied Technology Acceptance Model (TAM) to investigate the adoption of new technologies like Virtual reality (Metaverse) (Huang et al, 2023; Fussell et al, 2022; Jang et al, 2021; and Ghanbarzadeh et al, 2020). Davis (1989) used TAM to comprehend the variables that impact user's acceptance and utilization of technology. The model explains how users' intention to accept and utilize the technology is determined by two key variables, perceived ease of use and perceived usefulness. Perceived ease of use relates to the user's perception of how easy and user-friendly the technology is to interact with. In the context of this research, the perceived ease of use is relevant to understand when evaluating the user perception regarding the navigation in Metaverse technology. A more user-friendly Metaverse interface and hardware may contribute to a higher perception of ease of use. In Huang et al's (2013) study, users' perceived ease of use of virtual world like Second Life positively relate to flow/ immersion. Thus, we believe that the perceived ease of use will positively impact the immersive experience of a user of Metaverse.

Perceived Usefulness is an aspect of TAM model that revolves around the user's perception of the technology's usefulness and how it can enhance their performance or meet their needs. In the context of this research, perceived usefulness is linked to the utilitarian values associated with the Metaverse that will impact Immersive Experience positively (Huang et al, 2013). Users who find the Metaverse and Immersive Experience valuable for practical benefits are more likely to engage with it for travel-related experiences. A study conducted by Barrett et al (2021) revealed that immersion is a positive and significant predicator of perceived usefulness of Utilitarian Value.

User Engagement and Immersive Experience

The concept of *'engagement'* is shared by several disciplines (Bouvier et al., 2014), including psychology, computer science and education. As the Metaverse is a new and emerging technology and topic, therefore, there is no agreed upon definition for 'user engagement' in the immersive literature. However, some of the definitions adopted in the literature is presented in **Table 1.**

Citations	Definition	Author
(Tcha-Tokey et al., 2018)	*'A psychological state experienced because of focusing one's energy and attention on a coherent set of stimuli or meaningfully related activities and events'*	**(Witmer & Singer, 1998)**
(Papagiannidis et al., 2017)	*'A psychological state including involvement and effective usage of cognitive capabilities, as well as creativity'*	**(Mollen & Wilson, 2010)**
(Jeon, 2023)	*'As the level of UX with XR technology'*	**(O'Brien & Toms, 2008)**
(Yang, 2023)	*'The interaction between a person and an environment, and it includes participation, focus, and persistence within a task'*	**(Boyle et al., 2012)**
(Cheng et al., 2022)	*'A mental state that is accompanied by active and sustained, even complex, cognitive processing'*	**(Mollen & Wilson, 2010)**
(Wong et al., 2023)	*'Learning engagement serves as the intermediate mechanism between the various ways of training and learning effectiveness. It represents a set of affective and cognitive states that encompass both positive and negative attitudes towards doing the work and the willingness to make the effort to comprehend complex ideas and master difficult skills'*	**(Fredricks et al., 2004)**
(Papagiannidis et al., 2013)	*'User engagement is when direct engagement is taking place when a user experiences direct interaction with the objects in a domain, leading to a feeling of involvement directly with a world of objects'*	**(Hutchins et al., 1985)**
(Flavian et al., 2019; Flavián et al., 2021)	*'The quality of an experience characterized by the user's cognitive, temporal, affective and behavioural investment when interacting in a virtual environment'*	**(O'Brien, 2016; O'Brien et al., 2018)**

(Verhulst et al., 2021)	*'The emotional, cognitive and behavioural connection ... between a user and a resource'*	**(Attfield, 2011)**
(Mitre-Ortiz et al., 2022)	*'A reflection of complete absorption in a challenging activity, with the occurrence of high concentration, interest and enjoyment without any distraction'*	**(Hamari et al., 2016)**
(Carbonell-Carrera, Saorin, & Diaz, 2021)	*"The energy in action, the connection between a person and its activity consisting of a behavioural, emotional and cognitive form".*	**(Carbonell-Carrera, Saorin, & Diaz, 2021)**

Table 1 Definition of 'Engagement' in the literature with their original references

The notion of 'user engagement' is slightly different from the other types of engagement, such as customer brand engagement, consumer engagement or even student engagement (Harrigan et al., 2017; Hollebeek et al., 2020). In the above articles, engagement is categorized into different components. According to Papagiannidis et al. (2013) and (2017), engagement can be categorised into two levels: high and low. For instance, a user directly engaging with the product in a virtual environment will count as a high engagement, whereas a person observing the user interact with the environment will represent as a low engagement. Additionally, Aldaihani (2023) and Verhulst et al. (2021) studied three types of engagement, namely, cognitive, behavioural and affective engagement. Emotional engagement was studied in two articles (Huang et al., 2013; Xin, 2022) whereas behavioural engagement was studied in Flavián et al. (2021). Arce-Lopera et al. (2021) divided engagement into four dimensions based on User Engagement Scale (UES) Short Form: *focus attention, usability, aesthetic appeal and endurability*.

User engagement is influenced by the immersive experience. A study conducted by Dağ, Çavuşoğlu et al (2023) revealed that immersive experience through the use of Augmented Reality has a positive effect on the user engagement of tourists. Furthermore, users tend to share positive word-of-mouth if they can relate their immersive experience with enjoyment and rewarding (Kohler et al., 2011). The users taking the VR tour in Metaverse through the tourism website will have an immersive experience as well as better emotional engagement which leads to their willingness to speak to others (word-of-mouth or referrals) about their experience and

promote the website (Wagler & Hanus, 2018). The compelling experience that the user receives is gratifying, engaging and involving which leads to interest in the activities inside the Metaverse, re-experience of the immersive tour and higher engagement through evangelism and word-of-mouth (Kohler et al., 2011). Therefore, in our research context, the users who have an immersive, enjoyable, and rewarding experience, will share it with their friends or family via word-of-mouth, referrals and review the experience and we will count it as user engagement. Therefore, we can hypothesize as:

H1: User engagement is positively influenced by the immersive experience derived from the use of Metaverse

Immersive Experience and Virtual Reality (Metaverse)

According to Jeon (2023), user engagement in a virtual space may refer to the user's individual experiences during the exploration process. The degree to which users interact with a virtual reality is reliant upon their feeling of presence or immersion (Lee, 2006). There are four key concepts related to this feeling of 'being there', *presence, realism, flow and immersion* (Mitre-Ortiz et al., 2022). The definitions adopted by different articles with original references can be found in **Table 2**.

Term	Definition	Citation
Immersion	*"A psychological state characterized by perceiving that one is involved, included, and interacting with an environment that provides a continuous stream of stimuli and experiences".*	(Stanney & Salvendy, 1998; Witmer & Singer, 1998)
	'Being involved in a video game-related task while possessing an awareness of the outside world'.	(Brockmyer et al., 2009)
	'The "illusion" that the virtual environment technology replaces the user's sensory stimuli by the virtual sensory stimuli'.	(Carbonell-Carrera, Saorin, & Díaz, 2021)
Presence	*'The psychological experience of being in a place or environment in a non-physical virtual world'.*	(Qin et al., 2009)
	'The user's 'sense of being there' in the virtual environment'.	(Carbonell-Carrera, Saorin, & Diaz, 2021)
Realism	*'The realism of feeling inside a virtual world'*	(Ribbens, 2013; Ribbens & Malliet, 2010; Ribbens et al., 2016)
Flow	*'As a process of optimal experience, where people under a certain activity, put their abilities to the limit, by concentrated concentration and high enjoyment'.*	(Csikszentmihalyi & Hunter, 2003; Nakamura & Csikszentmihalyi, 2014) (Carbonell-

	'A pleasant psychological state of sense of control, fun and joy" that the user feels when interacting with the virtual environment.'	Carrera, Saorin, & Diaz, 2021)

Table 2 Definitions of immersion, flow, presence and realism

Presence has been studied and measured across multiple scopes, including spatial, sensory and social (Dongas & Grace, 2023). As we are measuring users in a virtual reality space (Metaverse), therefore, we will limit our research to spatial presence only (i.e., the sense that one is in another place that can be navigated (Wagler & Hanus, 2018). *Immersion* can also be divided into high and low levels, such as, using a Head Mounted Display (HMD) will have a high immersion level as compared to a desktop virtual environment (Carbonell-Carrera, Saorin, & Diaz, 2021; Flavian et al., 2019). Our research focuses on the Metaverse which is a highly immersive virtual reality environment, therefore, we will only restrict our research to high levels of immersion using HMDs.

Consumers feel through their senses, for instance, HMDs are heavily reliant on the sense of 'sight' and 'sound'. These sensory elements enrich a virtual experience (Flavian et al., 2019; Soh et al., 2021). Experiential products and services such as tourism and hospitality need to offer immersive experience to create an attractive destination. New, innovative, and immersive technologies are becoming mandatory for users to have an immersive experience (Tussyadiah et al., 2018; Witmer & Singer, 1998). Using an immersive technology can lead to better user engagement (Aldaihani, 2023; Allcoat et al., 2021; Allcoat & von Muhlenen, 2018; Arce-Lopera et al., 2021; De Luca et al., 2022; Flavian et al., 2019; Flavián et al., 2021; Ghanbarzadeh & Ghapanchi, 2020; Guldager et al., 2023; Nicolaidou et al., 2023; Verhulst et al., 2021; Xin, 2022). The use of immersion, flow, presence, and realism in defining the immersive experience allows for a comprehensive understanding of how individuals become fully engaged, emotionally connected, and mentally absorbed in the virtual environments like Metaverse, leading to more captivating and enjoyable experiences.

Using Metaverse devices can lead to a positive immersive and interactive experience for users (Ruiz-Rube et al., 2020). By creating a simulated environment that closely resembles the real world, Metaverse allows users to engage with digital content in a way that feels natural and realistic (Çoban et al, 2022). While using high-immersion devices like Oculus Rift or HTC Vive can significantly enhance the potential for user engagement, it does not guarantee engagement on its own. The hardware itself provides a more immersive experience through advanced graphics, motion tracking, and interactive capabilities, which can contribute to a sense of presence and realism. However, several other factors play a crucial role in ensuring user engagement, such as, content quality (graphics, visual appeal), system quality, vividness and avatars (Arce-Lopera et al., 2021; Dongas & Grace, 2023; Kohler et al., 2011; Lee et al., 2020; Papagiannidis et al., 2013; Papagiannidis et al., 2017).

The quality of the content, the use of avatars, and high-quality graphics within the metaverse has emerged as a focal point of investigation (Debara et al, 2022; Papagiannidis et al, 2017; Chague et al, 2015). Immersion, a key metric in assessing the success of virtual environments, hinges upon these interrelated factors. The quality of content, including its relevance, depth, and interactivity, plays a pivotal role in shaping users' experiences within the metaverse. A study conducted by Yu (2017) discusses the importance of light-field technology in producing high-quality VR content where users cannot differentiate between a virtual and real world. Avatars, as users' digital representations, not only serve as conduits for self-expression but also influence social interactions and emotional engagement. In, 2013, Garnier et al discussed that personalization of avatars impact immersion and satisfaction. Furthermore, the fidelity and realism of graphics contribute significantly to the sense of presence and immersion, as they enhance the visual and sensory aspects of the metaverse (Papagiannidis et 2017, 2013). Thus, understanding the intricate dynamics among content quality, avatars, and graphics is imperative for advancing our comprehension of immersion in the metaverse, which

has profound implications for fields ranging from gaming to education, and beyond. As these factors are present in the Metaverse, therefore, we will take Metaverse as an independent variable which will be defined by graphics, avatars, and content inside it. Therefore, we can hypothesize.

H2: Immersive experiences are positively influenced by the utilization of Metaverse.

User Perception

User perception or attitude towards the Metaverse can influence the relationship between the Metaverse and immersive experience (Lee et al., 2020). A user's perception is formed by not only the content inside the Metaverse, but also with the ease of use, comfort level of the headset, prior knowledge and simulation sickness derived from using the device. In the context of this research, we will focus on the above-mentioned constructs for user perception. How users perceive and interpret the Metaverse content along with the device, including its realism, presence, emotional impact, and relevance, can significantly influence the level of immersion and the overall quality of the Metaverse experience. Simulation sickness occurs when a user feels nauseous, dizzy, or uncomfortable while using VR technology (Vovka et al, 2018). It can be caused by factors like motion sickness or mismatch between visual and vestibular cues. If users experience simulation sickness, it can significantly impact their perception, leading to negative feelings about the technology and in turn it can influence immersive experience (Lin at al, 2022). Furthermore, ease of use refers to how user-friendly and intuitive the technology is (Fagan at al, 2012). If a VR system or Metaverse platform is easy to navigate and does not require a steep learning curve, users are more likely to have a positive initial perception which could lead to higher immersion (Tiersky, 2005). Headset comfort is crucial for user comfort during extended VR experiences. A comfortable headset reduces physical discomfort, such as pressure on the head, neck, or face, and minimizes distractions. If a headset is comfortable, users are more likely to enjoy their experiences and have a positive perception. Head-mounted

displays are advertised as a solution to increase the sensation of immersion of users in virtual environments (Kayatt et al, 2015). Users' prior knowledge about VR or Metaverse technology can influence their perception. Those who are familiar with and have positive past experiences with VR may have more optimistic expectations and perceptions compared to those who are new to the technology or have had negative experiences (Lee et al, 2020). A user's perception regards to ease of use, comfort level of the headset, simulation sickness and prior knowledge about the headset can influence an immersive experience. Therefore, we can hypothesize as:

H3: Effect of metaverse usage on immersive experience is stronger when users have positive user perceptions.

Hedonic Value

Technologies like metaverse when embedded within web-based platforms can offer custom-made personalised promotional approaches to deliver an immersive experience through use of virtual reality (Buhalis et al., 2019). An immersive experience will make decisions easier for users such as travellers during all phase of their visit or a journey i.e. pre-experience, during and post experience (Bec et al., 2019). During the pre-experience stage, metaverse can offer a realistic preview of how the travel experience and destination would look like (Neuburger et al., 2018), thus, preventing the risk and uncertainty associated with travel planning or an unwanted travel experience (Bogicevic et al., 2019). (Errichiello et al., 2019) studied how users of metaverse can benefit from immersive experiences while travelling considering situations like, while resting in their rooms or during free time, users can undertake immersive tours virtually to understand what they can expect at their locations of interests or local attractions or places out-of-hours. Furthermore, technology can be used to record and share their post travel experiences with a 360-degree video. These experiences when shared can encourage other potential users to make favourable choices by the provider of services.

Hedonic values are one of the key factors that influence the relationship between immersive experience and engagement in various contexts, including Metaverse experiences (Cheng et al., 2022; Papagiannidis et al., 2013; Papagiannidis et al., 2017). Hedonic value will originate from having fun, entertainment, enjoyment, and excitement while interacting with the products or services inside the Metaverse environment. In addition, the virtual experiences as a whole will further engage consumers and entice them to purchase relevant products or services (Papagiannidis et al., 2013). In the context of a tourism website like Booking.com or Expedia, hedonic values can be created through several means, such as, immersive multimedia content showcasing beautiful destinations, attractions, and experiences can evoke positive emotions and captivate users, leading to higher engagement (Griffin, 2017). Moreover, virtual tours embedded in the tourism website that offer users a simulated experience of exploring destinations, hotels, or attractions can create a sense of excitement and anticipation, enhancing the immersive experience (Griffin, 2017). Pengnate et al (2020) study findings suggested that spatial presence impacts hedonic value which then impacts user's engagement with the VR. The study confirmed that users enjoy virtual environments that provide the feeling of 'being there'. Therefore, we can hypothesize for this study as follows:

H4: Hedonic value mediates the effect of immersive experience derived from the Metaverse use on user engagement.

Utilitarian Value

Utilitarian value is a well-developed concept in consumer behaviour and marketing. In the hotel and tourism industry, utilitarian value is often linked to the practical benefits that users derive from their experience. A VR can help the users with several benefits that collectively form utilitarian value such as perceived usefulness, information seeking and ease in decision making. Research by Papagiannidis et al (2017) highlighted that immersive experience in a 3D virtual immersive environment impacts the utilitarian value positively which in turn leads to user

engagement. This finding is also backed by Pengnate et al's (2020) study where they proved that spatial presence impacts utilitarian value which then positively impacts user engagement. To explore the mediating role of utilitarian value, the study by Li et al (2010) is particularly relevant. They validated that utilitarian value mediates the relationship between information quality and intention to use a tourism/travel website, emphasizing that users perceive utility as a key factor influencing their engagement with digital travel platforms.

Perceived usefulness derived from TAM model is a critical dimension of utilitarian value in the context of the Metaverse. It refers to the extent to which users believe that the immersive experience and virtual services offered are valuable in helping them achieve their goals or solve their problems (Huang et al, 2013). Constantine (2023) stated that the Metaverse is perceived as a useful tool for efficiently planning trips, finding accommodations, and arranging activities. Users feel that it simplifies the travel planning process. The travel industry is ready for virtual disruption and the Metaverse presents a $20 billion opportunity (Constantin, 2023). Furthermore, Immersive experiences can provide users with in-depth information about hotels, destinations, and activities. Utilitarian value is created when users find this information to be accurate and valuable, leading to higher user engagement (Lee et al, 2021). Additionally, Utilitarian values can assist users to make a better, more educated and rational choice while assessing an item (Papagiannidis et al., 2013). The information users seek through VR can help users make informed decisions about their trips. Providing comprehensive and accurate information about destinations, accommodation options, transportation, and attractions can assist users in making well-informed travel choices, enhancing the utilitarian value (Lee et al, 2021). Therefore, we can hypothesize as:

H5: Utilitarian value mediates the effect of immersive experience derived from the Metaverse use on user engagement.

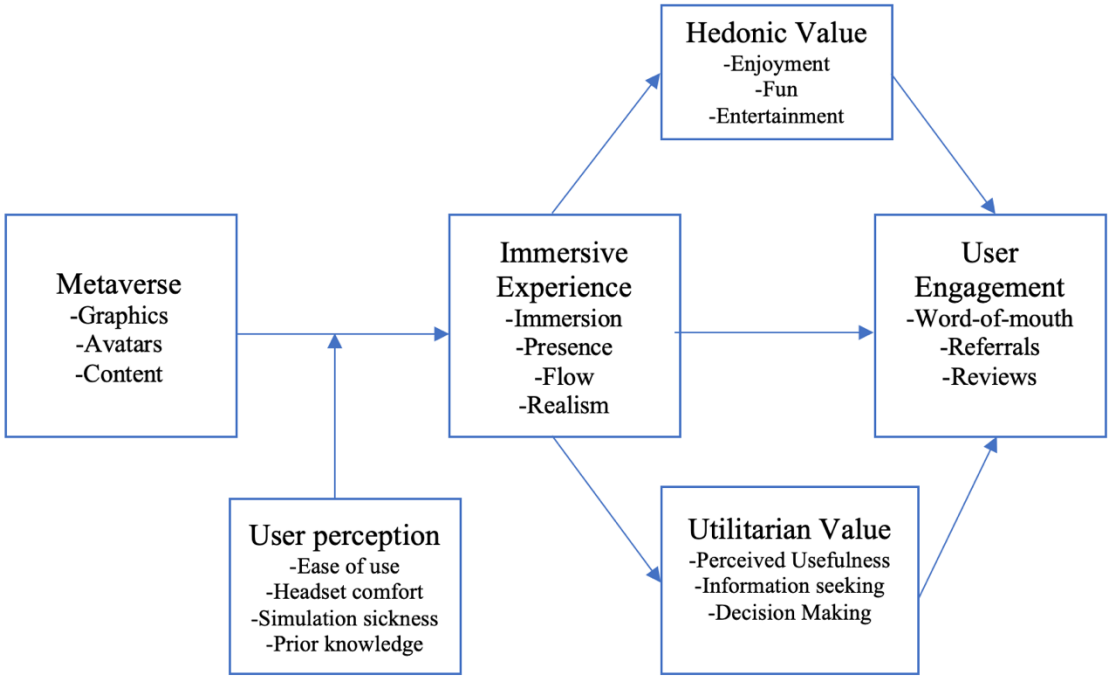


Figure 1: Conceptual model

METHODOLOGY

This paper adopted a triangulation approach including SLR, expert interviews and survey, to get a deeper understanding for our research objectives. The need for this triangulation approach arises from the desire to capitalize on the strengths of each method while mitigating their individual limitations. The SLR laid the foundation by identifying the gap in the literature, whereas, the interviews provided qualitative depth, while the survey contributed quantitative breadth to the research objective. Expert interviews, survey, and a systematic literature review, when combined, create a synergistic effect that enhances the validity and reliability of our research findings (Almajali et al, 2011). This section includes identifying relevant papers through Systematic Literature Review, collecting data from a mixed methods approach. First, this section includes a brief view of SLR then qualitative data collection via interviews is explained and lastly quantitative data collection through surveys is discussed.

Systematic Literature Review

A systematic literature review was adopted to examine use of metaverse as a virtual reality tool to provide immersive experience that will create superior user engagement. A Systematic Literature Review (SLR) is a rigorous and comprehensive approach to analyse existing literature to identify the research gap by summarising the literature on a specific topic or research question (Xiao et al, 2019; Rosalina et al. 2021). This method assisted in developing a conceptual framework for the research. SLR starts by defining the need for it and then move on to collecting, preparing, analysing data and reporting results (Paul and Barari (2022). The method used by this research to select the reporting papers is based on the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analysis) statement (Moher et al., 2015), a useful guideline which is recognised and widely used by the scientific community (Carvalho & Alves, 2023). The review process in our research has four steps: *identifying, screening, evaluating, and reporting* (Mirzaalian et al, 2019). The review was conducted between the period of June 2023 to July 2023.

The screening was done using keywords “Metaverse” and “Virtual Reality”. To refine the search, other keywords for “Metaverse” were also considered like “Virtual World”, “Virtual Environment”, “Augmented reality” and “Mixed reality”. However, the papers returned were reviewed carefully because, the term “Virtual World or Environment” describes only a single feature of many of the Metaverse. A Metaverse can be made up of multiple "virtual worlds". The keywords “Augmented Reality” and “Mixed Reality” were not part of the search strategy because they are a different type of Extended Reality, and this research is only focused on “Metaverse” which is a Virtual Reality (Dionisio et al., 2013).

Next, the concept of involvement and participation are both referred to as "User Engagement" in the literature (Hwang & Thorn, 1999). Therefore, the search strategy included the keyword “User Engagement” and “Engagement”. In addition, this study adopted the search terms independently for each database because each database has distinct search conditions

and syntax**.** No limits were set on the publication year. The query for searching Scopus database was initiated using a search string ((TITLE-ABS-KEY (metaverse AND user AND engagement) OR TITLE-ABS-KEY (virtual AND reality AND user AND engagement) OR TITLE-ABS-KEY (metaverse AND engagement) OR TITLE-ABS-KEY (virtual AND reality AND engagement)). To search Web of Science database the search string used for query was Metaverse AND User Engagement (Abstract) or Virtual Reality AND User Engagement (Abstract) or Metaverse AND Engagement (Abstract) or Virtual Reality AND Engagement (Abstract).

The literature was selected based on the eligibility criteria (Liberati, 2009). The papers were selected based on the inclusion criteria such as open access and exclusion criteria such as duplicate papers. The search was further refined through filters on open access, language, and document type on the selected databases. The articles were categorised into three groups, *Inclusion* (the articles related to the research question)*, Exclusion* (the articles not related to the research question) *and May be* (the articles that are undecided at this stage). The PRISMA flowchart in **figure 2** contains the flow diagram for selecting the relevant publications. Data collected was based on research question with a purpose to address the gap in the literature. A data extraction sheet on Excel was developed for the data collection process. The data collected were on the ten fields i.e., Title, Year of publication, Publishing journal, Keywords, Theoretical framework, Conceptual framework, Variables studied, Methodology, Sample size and Device used. With regards to the device used in the article, it was registered if the studies used Head Mounted Display (HMD), mobile or smartphones, desktops, or laptops. In cases where the subjects used an HMD, it was also reported which specific model was used in the research, such as Oculus Quest, Oculus Rift or any other HMD. Furthermore, the type of platform the studies used, namely an online platform, a website or a mobile app was also reported. Moreover, the type of VR such as Metaverse, Second Life or an own creation of Virtual Reality

was also documented. One of the most important variables collected (User Engagement) involved classifying which factors are being evaluated and which instruments were used to measure user engagement within the Metaverse or Virtual reality.

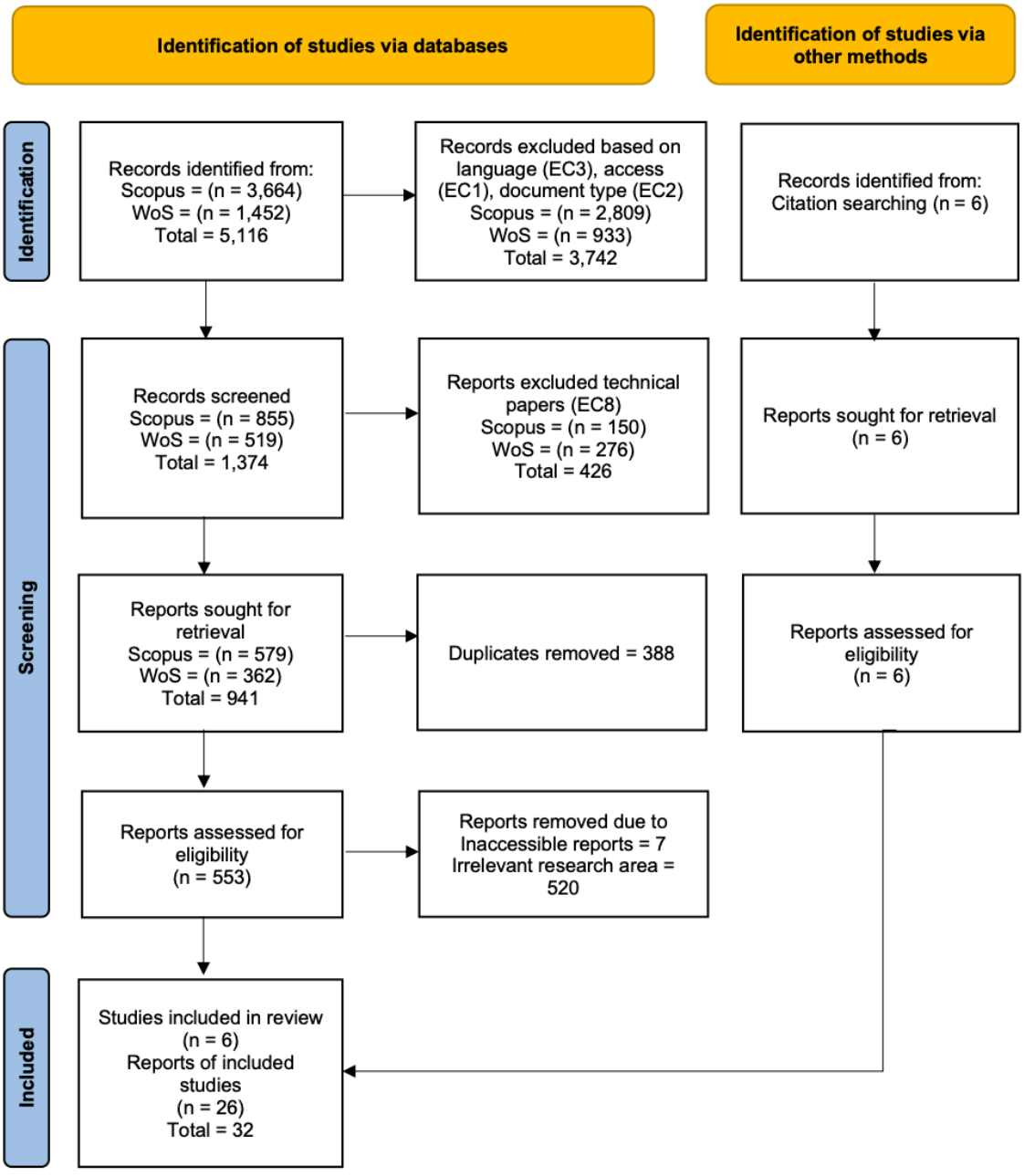


Figure 2. *PRISMA flowchart adopted from (Page et al., 2021)*

Data collection: Expert Interviews

Qualitative data was collected through 25 semi-structured interviews which lasted for 30 to 60 minutes. The validity and reliability of qualitative data was a paramount consideration. The interviews were first conducted by experienced researchers trained in qualitative methodologies to enhance the credibility of the data. To ensure dependability, an audit trail documented the research process, decisions, and any modifications made during data collection and analysis. Peer debriefing sessions were conducted for reviewing and discussing emerging themes to ensure consistency and trustworthiness in the interpretation of findings. These measures collectively contribute to the robustness and trustworthiness of the qualitative findings. Finally, the data was collected from the participants. The sample size for qualitative interviews was determined through the principle of data saturation, where data collection continued until no new themes or insights emerged from subsequent interviews (Guest et al, 2006). All the interviews were recorded with consent from the participants. The participants for this study were selected using a purposive sampling approach, which is a non-probability sampling method often employed in qualitative research to identify and select individuals who possess specific characteristics or experiences relevant to the research objectives (Patton, 2002). The participants selected were users of Metaverse and had some experience with virtual tourism. Participants were recruited through a multi-stage process. In the initial stage, potential participants were identified through social media platforms, online forums related to virtual tourism, and professional networks. For inclusion in the study, participants were required to meet specific criteria. Individuals eligible for participation were those who actively engage with the Metaverse and possess first-hand experience with virtual tourism. Invitations were sent to individuals who met the inclusion criteria, providing them with information about the study's objectives, procedures, and the voluntary nature of their participation. Before participating in the interviews, all participants were required to provide informed consent,

which included a detailed explanation of the study's purpose, the voluntary nature of their involvement, the right to withdraw at any time, and assurances of confidentiality.

Data collection: Main Survey

The quantitative data was collected through an online survey containing 25 questions from 118 participants. The questions were adapted from previous studies with some self-developed questions derived from the interview data. All the survey statements were based on a 7 point Likert scale (Matell at al, 1971) where '7' was 'Strongly Agree' and '1' was 'Strongly Disagree'. Table 3 shows the constructs, questions, and references for each item of the survey. An online survey was created via Google Forms and the link was posted on social media platforms related to Metaverse/Virtual reality utilizing a convenience sampling approach. The survey started with a cover letter containing all the necessary information about the survey. The survey did not contain any personal questions to keep the data collection as anonymous as possible. All the questions were mandatory to submit the response, therefore, the response rate was 100%. After the data collection was complete, statistical analysis were run on the data for hypothesis testing.

Construct	Statement	Source
Metaverse (MV)	MV1 - The content inside the Metaverse feel so authentic that it makes me think that the virtual characters/ objects existed for real.	Georgiou et al (2017)
	MV2 - I had a sense that I was interacting with other people in the virtual environment, rather than a computer simulation (avatar).	Multimodal Presence Scale – Dongas et al(2023)
	MV3- Graphics of the virtual environment let me visualise what the real objects or location might look like	Papagiannidis et al (2013)
Immersive Experience (IE)	IE1 - While using the virtual reality device I am absorbed in what I am doing.	Sun et al (2019)
	IE2 - I completely concentrated on the contents while I am doing the VR tour.	Lee et al (2021)
	IE3 - I felt like time went by very quickly when I was doing the VR tour.	
	IE4 - I didn't have any irrelevant thoughts or external distractions during the activity	Georgiou et al (2017)
User Engagement (UE)	UE1- I am likely to spread positive word-of-mouth about the VR experience.	Maxham et al (2002) ; Salanova et al (2005) and Taheri et al (2021)
	UE2 - 2. When I have positive and immersive virtual reality experiences, I am more likely to participate in referral programs by sharing links with friends or acquaintances	
	UE3 - When I have immersive Metaverse experiences, I am more inclined to provide positive feedback and reviews.	
User Perception (UP)	UP1 - I find the virtual reality easy to use.	Agarwal et al (2000)
	UP2 - The virtual reality headset while engaging within the Metaverse is comfortable for me.	Derived from interviews

	UP3 - I feel discomfort, dizziness, or simulation sickness while using the headset	
	UP4 - My prior knowledge and beliefs about virtual reality influence how immersed I feel in the Metaverse	
Hedonic Value (HV)	HV1 - Using VR is entertaining.	Lee et al (2020)
	HV2- Tourism related VR is a fun activity.	Kim et al (2020)
	HV3 - Using the tourism-related VR activity is enjoyable for me.	
Utilitarian Value (UV)	UV1 - I think the information provided by virtual reality tourism experience is useful	Kim et al (2020)
	UV2 - I can easily access the information of the tourist attraction/tourism destination through the VR tourism experience.	Anderson et al (2014)
	UV3 - VR helps me to make a better decision about the destination if I am considering travelling	Derived from interviews

Table 3 *Constructs, items, and source*

Results and Analysis

As this study has adopted a mixed methods approach, therefore, this section first presents the analysis of SLR, then quantitative findings which are achieved by Structural equation model (SEM) and qualitative findings from the interviews are discussed.

Findings from Systematic Literature Review

The initial search gave us a total of 5,116 articles. The filters drastically reduced the search result from 5,116 to 1,374 articles. Further, this stage involved thoroughly reading the abstract of the searched results. Highly technical papers (n = 426) such as mathematics and chemical engineering were excluded. The result came down to 941 articles. The articles were kept for more in-depth analysis during the phase of full-text analysis when there was no consensus. Since there was no limit set on the publication year, all the related research (n = 941) were retrieved and imported to EndNote to remove the duplicated papers, adjust, and export it to a spreadsheet in Excel. Another 6 more articles that we knew are related to our study, were included for analysis. The final selection of 32 articles were predominantly published in the period from 2011 to 2023 (see Appendix A for a full list of articles). More papers started publishing after 2021, as 'Metaverse' has only recently surged in popularity since the announcement of rebranding of Facebook to Meta by Mark Zuckerberg in October, 2021 (Paul, 2021). The selected articles were of diverse background, however, articles related to user

475 engagement in Metaverse or Virtual reality were published in computer science discipline. In
476 business and management studies, out of 7 papers, 5 were published in tourism and hospitality
477 journals.

478 To identify the measurements of user engagement in the metaverse, we selected only
479 empirically tested papers. 3 studies were mixed methods and 29 were quantitative. From a
480 methodological perspective, most of the studies adopted a quantitative approach with
481 experiment and survey in their study. In cases where experiments were conducted, the sample
482 size consisted of as low as 16 users to maximum of 368 users. However, in mixed methods
483 studies, the sample size was 21, 27 and 51 users. Out of 32 studies, 16 of them collected the
484 data from students at schools, colleges, or universities. All the quantitative or mixed methods
485 studies in the final papers either compared two or three devices with each other for the
486 immersion, flow, presence, and user engagement – with one being low in immersion such as a
487 desktop or mobile phone and the other with a Head Mounted Display (HMD) headset such as
488 Oculus or HTC Vive. Most of the articles adopting an experimental design used Oculus.

489 Word clouds are used to represent textual data in a visual format. They help in providing
490 a preliminary point for an in-depth analysis (Burch et al., 2013; Sinclair & Cardew-Hall, 2008).
491 A word cloud was created using R Studio for the selected articles. All these research papers
492 were downloaded in a PDF format and then converted to TXT files. A maximum word limit of
493 200 words was set. Punctuations, numbers, common English words were removed. The entire
494 text was converted to lower case letters. The image generated can be seen in figure 3. The 10
495 most prominent words highlighted are *'virtual', 'experience', 'engagement', 'learning',*
496 *'reality', 'research', 'environment', 'presence', 'technology'* and *'immersive'*. The frequency
497 of the first 50 words is as below. From the table, we can analyse the common theme of these
498 articles which is 'virtual', 'experience', 'engagement' and 'learning' because most of the
499 studies were identifying the engagement in students via a virtual reality in education sector.

Figure 3: *Word cloud*

Qualitative Findings

To gain a more in depth understanding of the users' immersive experience and their engagement within the Metaverse, we conducted 25 interviews that contained open-ended questions. In addition to the scripted questions the users were asked probing questions to explore additional themes as well as to encourage participants to further explain their answers. The interviews were transcribed from the video and audio recordings. All participants gave written and verbal consent to be recorded. These interviews were analysed using thematic analysis for each open-ended question which identified common themes and patterns in the responses to the questions. A structured technique (Braun et al, 2006) was used to perform the thematic analysis, and the responses were coded and arranged according to the data's content. The themes were then combined with the quantitative analysis's findings to give a complete picture of the variables affecting User Engagement in the Metaverse. We employed an inductive method in thematic analysis, which is suitable for this kind of design environment since it minimises the usage of prior assumptions or ideas in the data analysis process. This enabled us to find and investigate fresh connections and insights in the data, resulting in a rich

and complex understanding of users' immersive experiences and user engagement in the Metaverse.

Thematic Analysis

From the interviews, we identified 5 key themes, *immersion and realism, technology and device usage, perception and expectations, user engagement and interaction and lastly utility and gratifications.* These key themes helped us in deeply understanding the proposed research model and their relationships. Following are the key themes with their individual sub themes.

Immersion and Realism

This theme centres around the user's desire for immersive experiences in the Metaverse and virtual tourism. It includes their definition of immersion, what contributes to it, and how high-quality graphics and audio enhance emotional engagement. Figure 4 shows a word cloud of the words spoken about immersive experience. The most frequently used word was *'feeling real'* and its relevance was explained by one of the respondents in following words: *"In my opinion, it means the feeling of being real like I am actually in that virtual environment."* and "*I think the immersive experience should be combined with both the eyes' view and also the hearing, the sound you hear... I think the immersive experience will depend on all kind of feeling, not just what you see."* One of the interviewees explained it in detail, "*When you put on that headset, you're able to get that exhilaration and feeling that it doesn't necessarily mean there has to be an adrenaline rush. But that feeling where you excite your very senses themselves. And to where you take off that headset, all of a sudden things in your real life environment become more vivid, and it gives a sense of clarity kind of like what spiritualists get when they come out of a meditative state. That is the enticement of immersive experiences with immersion. You feel like, not only were you actually there. Well, that's the point of*

immersion. You're supposed to have something real to look at, whether it not real does not mean it has to be real."

When the users were asked to define immersive experience, they gave references of several games, tourism, and entertainment experiences. They also related the experience with their senses, for instance, a few of them mentioned that their senses of feeling/touching, visuals and audio were provoked by interacting with in the Metaverse environment. This finding is proven by Papagiannidis et al's (2010) research which showed that the Metaverse's environment tricks the user's senses, and they are not fully aware of the real time and space. In an interview, the users defined an immersive experience as one where they genuinely feel present in the virtual environment and with graphics, sound and avatars, their immersive experience could improve in following words*:*

"So the immersion depends on many factors like colors, graphics, pixels, etc. For tourism, I think graphics play the most important part. Because without having a good quality of video and graphics, there is no point in watching the virtual tours." Another interviewee responded by saying, *"An animation from an anime can also look real as well with its graphics. If it's done well enough. The world building the Scripture, the writing can actually put you in that immersive experience. They did the same. Disney did the same thing when they took a book from the early 2000 s and 1990s. It was called Artemis Fowl. When they took that book and reduplicated the exact vividness from someone's imagination. and put it directly on the screen and captivated the audience. Now, kids, that don't even know what the book was, because it's 2023, and that books over 20 years old. You'll be lucky if you find it in school. but that's the immersive experience that I'm talking about, just like when you read a book, and you're captivated by the book itself, and you put the book down. The same thing has to be done with VR. That immersive experience makes you want to come back again and again and again."*

Some of the users highlighted that immersion is influenced by various factors, including graphics quality. They recognize that the visual elements such as colours, graphics, and pixel quality play a crucial role in creating a sense of immersion in the Metaverse. A study conducted by Papagiannidis et al (2013) and Papagiannidis et al (2017) proved the above point that vivid colours and graphics affect a simulation experience with in the virtual environment.

Figure 4: *Word cloud for 'immersion'*

Technology and Device Usage

This theme highlights the user's technology-related experiences, including the duration of Metaverse usage, preferences for immersive technologies, and challenges related to comfort and device usage. Some of the interviewees have been using the Metaverse for a year, indicating a moderate level of experience with virtual environments. Several users said that they spend about an average of 40 minutes using the headset in one sitting. Most of the users used the device for gaming, tourism, and entertainment. The users had experience of using and/or creating content on 360-degree videos and virtual 3D tours on smart phones or laptops. When we asked to compare which of these devices, they think is highly immersive, most of the interviewees gave reasoning for 'Metaverse/Virtual Reality'. This aspect was highlighted by respondents as given below:

"*Well, the immersion level is different in all these devices. So, for example, 360° video on your phone will look different because you will have to move your finger to actually see everything around that place. A 3D virtual tour either on your laptop or a phone will be the same as the 360° video, but if you talk about taking the 3-D tour or 360° video on your Metaverse device, be it oculus or any other, then the immersion level is high. I am not saying that 360° video or the 3D tour are not immersive, well they are, but if we compare it to the immersion level in the Metaverse, it's quite low so 3-D tour taken on your oculus or meta quest devices will be higher than those that you take on your phone or laptop".*

According to a study by Wagler et al (2018), the users of virtual reality with a headset device will have higher levels of presence as compared to a desktop 2D environment. Additionally, most of the interviewees described some discomfort associated with wearing the VR headset, particularly around the nose and head due to its weight. Most frequently used words were *'heavy', discomfort', 'tight', 'uncomfortable'.* They also noted that wearing prescription glasses with the headset can be uncomfortable, potentially highlighting an area for device improvement to enhance user comfort. Moreover, the interviewees shared that the external distractions, such as sounds from the real world, can disrupt their immersion in the Metaverse. This feedback suggests that the comfort of VR devices is crucial for maintaining immersion.

Perception and Expectations

This theme explores the user's evolving perception of the Metaverse and virtual tourism, including their initial thoughts about the technology before they used it, comfort considerations, and how perception affects immersion and engagement. When the users were asked about their initial perception of Metaverse when it was first introduced, most of them showed excitement. One of the respondent also considered it cool and expressed their excitement by saying:

"*I was blown away? I was like, this is so cool.* Another interviewee responded by saying "*Well, as I have already used that video, and you know 3D virtual tours. So, for me Metaverse was quite cool, like I was like, oh, super, super impressive kind of thing. that's nice. You don't have to leave your house. You don't have to leave the comfort of your bed, and you can just go into places. So, that was very cool for me. From the tourism perspective, you can go to multiple destinations in just a moment of time."*

Some of them were sceptical as they were not convinced about what this technology could do. However, over time, their perception seemed to have shifted towards enthusiasm, as they mentioned becoming addicted to the Metaverse and recognizing its potential. The interviewee wanted this technology during the pandemic when they were stuck at home due to COVID-19.

"Well, when it was first introduced, I watched a video of Mark Zuckerberg introducing the Metaverse and the rebranding of Facebook to Meta, I was sceptical. I didn't think that it will work but after using it I am addicted. It's an amazing technology and it has potential to do great things. And when we talk about the tourism inside the Metaverse, I think it would work because when the pandemic hit in 2019, everybody was at home, stuck in their rooms and everyone couldn't travel so if this kind of technology was introduced back then, it would've been a great opportunity for everybody to relax and to visit the different places as well.

The interviewees also expressed a strong desire to visit real-world destinations that they had explored virtually within the Metaverse. This desire suggests that their virtual experiences positively influenced their intention to engage in physical tourism (Griffin et al, 2017). It highlights how the Metaverse can serve as a tool to stimulate interest in travel, potentially leading to real-world tourism opportunities. Moreover, the interviewees shared instances where poor-quality content negatively impacted their immersion. One of the interviewee expressed that a poor-quality graphics or content made him leave the game quickly which he was looking

forward to. Respondents illustrated how their perception of content quality can either enhance or detract from the immersive experience by saying:

"If you have the good quality video, if you have the good sound quality, then it creates an experience that you'd not forget. If it lacks, then it will ruin the whole experience."

Overall, the interviewee's perception of the Metaverse and virtual tourism had a notable impact on their immersion and engagement within this virtual environment. Their evolving perception, from scepticism to enthusiasm, reflects the transformative nature of the technology and its potential to reshape how individuals perceive and experience tourism. Additionally, their emphasis on content quality highlights the importance of creating high-quality virtual experiences to enhance user engagement and immersion.

User Engagement and Interaction

User engagement in virtual tourism is a central theme, emphasizing the importance of interaction such as WOM, referrals and online reviews and memorable experiences that facilitate engagement. Throughout the interview, the interviewees consistently emphasized the importance of interaction as a key aspect of engagement within the Metaverse. They defined virtual tourism engagement as moving around the virtual tours, talking to the avatar tour guide, touching/clicking the information tags within the virtual tours. They believed that true engagement in virtual tourism involves meaningful interaction with the environment and the content.

"I would say, be able to walk around alright, be able to feel in touch and give some. I guess some feedback from the controllers. for example, for the painting like the painter. What kind of material is used? What is it describing."

Interaction was described as crucial for creating a sense of presence and immersion. The interviewee's definition aligns with the idea that engagement in virtual tourism goes beyond

passive observation; it involves actively participating and interacting with the virtual world. This finding is also backed by Jeon's (2023) research which showed that interaction increased a user's engagement within the XR environment. The interviewees also mentioned the importance of Word-of-Mouth (WOM), referral programs, and online reviews as factors influencing engagement.

"I would recommend to those kinds of friends who are having the same criteria as I do. So it depends on person to person as well." And "I would recommend to the other people that I have something in common with. I'm in a couple of VR groups."

Positive experiences within the Metaverse can lead to recommendations and referrals to others, enhancing engagement through social interactions and shared experiences (Wagler et al, 2018; Kohler et al, 2011). This implies that user engagement is not limited to the individual's interaction with the technology but extends to their interactions within their social networks, where they share their virtual tourism experiences and recommendations.

Utility and Gratification

This theme focuses on the practical and entertaining aspects of virtual tourism, such as the usefulness of virtual 3-D tours for hotel room exploration and their efficiency in real-world travel planning. When asked about the virtual tourism, several users said that they explore tourism experiences within the Metaverse quite often, driven by their passion for travel and the desire to prepare for upcoming trips. All the users explained that they enjoy the experience and find it quite useful to make informed decisions and will be using it for their future trips.

"Well, when I'm inside, the Metaverse feel excited, I feel joy because I enjoy the experience with in the Metaverse, so if I'm taking a virtual tour and if it's highly immersive then I will feel happy, I will feel joy." Another interviewee said, *"At the beginning, I feel it is*

stunning. I feel like it's a new world that I've never feel before and now I want to be a part of it."

The interviewees also mentioned the usefulness of using the Metaverse for future travel. *"Virtual 3-D tours are useful when we talk about tourism. I would love to have a visit of my room that I will be booking in a hotel or a resort, because when we book a room on booking.com, it generally gives us a basic photo of that room. And if I can virtually take a tour surrounding that resort or hotel, then it will be helpful as well because if I want something from the convenience store, then I would know where to go instead of asking at the reception.* The interviewees found value in using VR tours to gather information about destinations, such as finding nearby restaurants and planning routes, demonstrating a practical use of virtual tourism. This finding was also evident in research by Huang et al (2013) where they found that by enhancing a user's positive feelings, immersive experience and emotional engagement in visiting a virtual 3D tourism site can contribute to developing user's travel intentions and awareness of destinations in their trip decision-making process. These five key themes encompass the user's experiences, preferences, challenges, and perceptions related to the Metaverse and virtual tourism, providing a structured framework for analysing the interview data.

Measurement and Findings

SEM was implemented to analyse the collected data for the study. It has the competency of evaluating all the paths in one regression analysis (B. Wu et al, 2014). PLS-SEM utilises component-based approach for the estimation (Karahanna et al., 2006). Smart PLS 4.0 was used to analyse the data (Ringle et al., 2015). The two-step system suggested by Anderson et al (1988) was utilised to assess the goodness of the proposed model. Firstly, the measurement

model was evaluated for its validity and reliability. Then the structural model was tested to survey the strength and direction of the connection between the variables.

Model assessment

The quality of the constructs in the study is assessed by the measurement model which consists of validity and reliability. It starts with the evaluation of the factor loadings which is followed by establishing the construct reliability and validity. This methodology assists with improving the capacity of the researcher to accomplish exact outcomes that can be generalised (Hair et al., 2019). The two most used methods to assess reliability are Cronbach alpha and Composite reliability which are presented in Table 4. Cronbach alpha's score ranged from 0.738 to 0.822 whereas Composite reliability ranged from 0.835 to 0.881. Both indicators of reliability have the required threshold of over 0.7 (Hair et al) which means the selected survey items for each construct are reliable measures. Additionally, all factor loadings value obtained in the measurement model exceeded the threshold of 0.7, however, only IE2, UP2 and UP4 had the factor loadings of 0.682, 0.676 and 0.650 respectively. According to Hair et al (2010) factor loading values should be higher than 0.5. Several studies reported the factor loadings of 0.5 and above for better results (Truong et al, 2011; Hulland, 1999), whereas in tourism perspective Chen et al (2007) considered 0.5 as an acceptable loading threshold. Therefore, all the factor loadings were retained for all items and hence are acceptable. AVE ranged from 0.564 to 0.711 which also exceeded the lower threshold of 0.5 (Dos Santos, 2022; Mohammad et al., 2020). With a factor loading greater than 0.5 along with AVE values exceeding the lower threshold (0.5) are an indication of convergent validity of the measurement model (Lekwa et al., 2019). Thus, the measurement model for the proposed had convergent validity.

Construct	Items	Factor Loadings	VIF	Cronbach Alpha	Composite Reliability	AVE
HV	HV1	0.872	1.680	0.744	0.852	0.659
	HV2	0.759	1.508			
	HV3	0.800	1.384			
IE	IE1	0.814	1.508	0.779	0.856	0.598

	IE2	0.682	1.414			
	IE3	0.798	1.628			
	IE4	0.793	1.561			
MV	MV1	0.863	1.645	0.799	0.881	0.711
	MV2	0.855	2.000			
	MV3	0.811	1.659			
UE	UE1	0.854	1.732	0.791	0.878	0.705
	UE2	0.860	1.850			
	UE3	0.805	1.526			
UP	UP1	0.915	1.314	0.822	0.835	0.564
	UP2	0.676	2.151			
	UP3	0.733	2.079			
	UP4	0.650	2.063			
UV	UV1	0.880	1.454	0.738	0.846	0.647
	UV2	0.739	1.412			
	UV3	0.788	1.559			

Table 4. *Convergent validity, Discriminant validity and Construct Reliability*

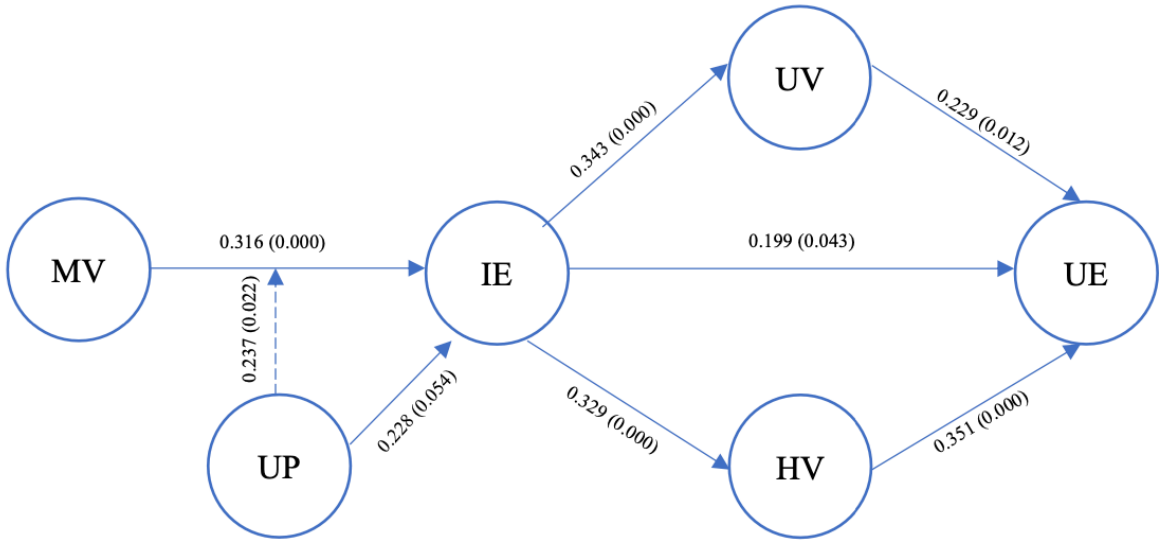
On the other hand, the discriminant validity can be evaluated through Fornell-Larcker criterion. Following Fornell and Larcker's (1981) recommendation, the discriminant validity can be checked by comparing the square root values of AVE and the correlation coefficients between the latent constructs (presented in Table 5). All the square root values for AVE were higher than the correlation coefficients, hence, the discriminant validity was acheieved (Rasoolimanesh, 2022). Variance Inflation Factor (VIF) is a measure of the amount of multicollinearity in the indicators in regression analysis (Fornell et al, 1982). According to Hair et al (2016), multicollinearity of 5 and above indicates potential issue. Table 4 presents the VIF values for all the items which are below 3 ranging from 1.314 to 2.151 which means that there is no multicollinearity. According to Hu et al's (1999) model testing criterion, the cut off for SRMR is greater than 0.08 to have a good model fit. In this study the values for SRMR is 0.098 which means the model is a good fit.

	HV	**IE**	**MV**	**UE**	**UP**	**UV**
HV	**0.812**					
IE	0.342	**0.773**				
MV	0.292	0.435	**0.843**			
UE	0.383	0.393	0.321	**0.84**		
UP	0.194	0.257	0.314	0.112	**0.751**	
UV	0.242	0.328	0.318	0.472	0.067	**0.804**

Note: Bold values represent the square-root of AVE
Abbreviations: MV – Metaverse usage; UP – User Perception; IE – Immersive Experience; HV – Hedonic Value; UV – Utilitarian Value; and UE – User Engagement

Table 5. *Inter-correlation between the constructs and the square root of AVEs (Fornell–Larcker criterion).*

Structural Equation Modelling (SEM) was applied (Figure 5) to determine the impact of Metaverse utilisation on User Engagement through Immersive Experience along with mediators (Hedonic and Utilitarian values) and a moderator (User Perception). Following hypotheses were tested with a sample size of 118 users using bootstrapping method.



Note: The dotted line shows the moderation, and the straight lines indicate direct relation.
Abbreviations: MV – Metaverse usage; UP – User Perception; IE – Immersive Experience; HV – Hedonic Value; UV – Utilitarian Value; and UE – User Engagement

Figure 5: *Structural Modelling of the proposed hypotheses with Path coefficients and p-values*

Hypotheses Testing

Table 3 presents the path coefficients, standard deviations and p values. Hypothesis 1 stated that the utilization of Metaverse (MV) leads to positive Immersive Experience (IE). The path was significant ($\beta = 0.316$, $p < 0.001$) and the hypothesis was supported which means that the users have immersive experience after the Metaverse use. This was also supported by the qualitative data as all the users reported having an immersive experience after Metaverse use regardless of the device used. This finding is evident from the studies by (Tussyadiah et al., 2018; Witmer & Singer, 1998) which states that new technologies like Metaverse devices are

becoming mandatory to have an immersive experience. Furthermore, Hypothesis 2 examined that the Immersive experience (IE) derived from the Metaverse (MV) use leads to positive User Engagement (UE). The Beta coefficient was significant and hypothesis 2 was supported ($\beta = 0.199$, $p < 0.05$) which means that the users spread WOM, use referrals and give online reviews (User Engagement) after having an immersive experience from the Metaverse use. This quantitative finding was also backed by interviews and literature (Aldaihani, 2023; Allcoat et al., 2021; Allcoat & von Muhlenen, 2018; Arce-Lopera et al., 2021; De Luca et al., 2022; Flavian et al., 2019; Flavián et al., 2021; Ghanbarzadeh & Ghapanchi, 2020; Guldager et al., 2023; Nicolaidou et al., 2023; Verhulst et al., 2021; Xin, 2022). Furthermore, to test the moderation effect of User Perception (UP) we incorporated moderation analysis using SMART PLS4. The test also indicated that User Perception (UP) has no direct impact on Immersive Experience (IE) ($\beta = 0.228$, $p > 0.05$) rather a moderating impact. Hypothesis 3 was also supported ($\beta = 0.237$, $p < 0.05$) which states that User Perception (UP) with regards to headset comfortability, simulation sickness, prior knowledge and ease of use moderates the relationship between the Metaverse (MV) and Immersive Experience (IE) (Lee et al., 2020). This finding is also supported from the interviews as the interviewees reported a discomfort and headache derived from simulation which affected their immersive experience. They also mentioned that their prior knowledge about the device and technology along with the navigation impacted their experience.

Hypotheses	Path	Beta coefficients	Standard deviation	P values	Supported
H1	MV → IE	0.316	0.081	<0.001	Yes
H2	IE → UE	0.199	0.099	0.043	Yes
H3	UP x MV → IE	0.237	0.103	0.021	Yes
	UP → IE	0.228	0.118	0.054	

Table 6: Path coefficients, p values and hypotheses testing summary.

Indirect Effects

To test the mediating role of Hedonic and Utilitarian value on user engagement in the structural model, bootstrapping procedure was used (N = 10,000 samples). The results (see Table 7) revealed significant ($p < 0.05$) partial mediation of Hedonic and Utilitarian value between User Engagement and Immersive Experience. Hence, hypotheses 4 and 5 were supported. In the interviews, the participants mentioned that if they enjoy the experience and had some practical benefits from it, then they would recommend the same experience to others through WOM, referrals or write online reviews.

	Total effect		Direct effect			Indirect Effect				
Path	**Coefficient**	**p-values**	**Coefficient**	**p-values**	**Hypotheses**	**Coefficient**	**SD**	**T value**	**p-values**	**Supported**
IE → UE	0.394	<0.001	0.199	0.041	**H4:** IE → HV → UE	0.079	0.038	2.064	0.041	Yes
IE → UE	0.394	<0.001	0.199	0.041	**H5:** IE → UV → UE	0.115	0.040	2.897	0.004	Yes

Table 7 *Mediation results*

DISCUSSION

The findings presented in the above section provide valuable insights into the relationship between Metaverse, Immersive Experience, User Engagement, User Perception and Hedonic and Utilitarian Values. To understand the role of emerging technologies in forming user experiences in a virtual environment, these relationships hold significant implications. Hypothesis which states that the utilization of the Metaverse (MV) leads to positive Immersive Experience (IE) (H1) was supported by quantitative data ($\beta = 0.316$, $p < 0.001$). This result aligns with previous research by Tussyadiah et al. (2018) and Witmer et al (1998). Tussyadiah et al. (2018) demonstrated how immersive technologies within the Metaverse could generate heightened user engagement. Their work emphasised the transformative potential of the Metaverse, where users could surpass physical boundaries to explore virtual worlds and interact with digital counterparts. Similarly, Witmer et al (1998) delved into the concept of presence within immersive environments, suggesting that users perceive themselves to be present in the

virtual world, and this perception has a profound impact on the immersive experience. This sense of presence was indeed a recurring theme in our study, with users consistently reporting a heightened sense of immersion when engaging with the Metaverse. What makes our findings even more compelling is that they were substantiated by qualitative data. In-depth interviews with expert users revealed a unanimous sentiment - the Metaverse consistently delivered a heightened sense of immersion, irrespective of the specific HMD device or technology used. Users frequently described feeling as though they were physically present in the virtual spaces they explored, suggesting that the Metaverse has a remarkable ability to evoke strong emotional and cognitive responses.

Next hypothesis H2 delved into the intriguing relationship between Immersive Experience (IE) and User Engagement (UE). This hypothesis was not only confirmed but also revealed some profound insights. Our quantitative data, with a significant β value of 0.199 and a p-value of less than 0.05, provides strong statistical support for the idea that immersive experiences have a direct impact on user engagement. This finding is far from isolated; it resonates with an extensive body of literature in the field. Numerous previous studies have contributed to our understanding of the connection between immersive experiences and user engagement. Researchers such as Aldaihani (2023), Allcoat et al. (2021), Arce-Lopera et al. (2021), De Luca et al. (2022), Flavián et al. (2021), Guldager et al., (2023), Nicolaidou et al. (2023), and Verhulst et al. (2021) have all contributed to the growing body of evidence supporting this relationship. Their work consistently demonstrates that immersive experiences, whether in virtual reality, augmented reality, or the Metaverse, serve as powerful catalysts for enhancing user engagement. Our findings were further corroborated and enriched by qualitative insights obtained from interviews with users. Respondents consistently shared their inclination to engage in word-of-mouth (WOM) recommendations, referrals, and online reviews after experiencing immersion in the Metaverse. Users' willingness to spread the word

about their positive immersive experiences is a compelling validation of Hypothesis 2. These interviews provided depth and context to the quantitative findings, revealing the nuanced ways in which immersion influences user behavior. This alignment between quantitative data and qualitative insights reinforces the idea that immersive experiences are not only engaging but also inspiring. When users feel a heightened sense of immersion within the Metaverse, they are more likely to become active promoters of their experiences. This includes referring friends and family, leaving online reviews, and sharing their positive encounters on social media platforms. Such user-generated content is incredibly influential in shaping the perceptions and decisions of others, emphasizing the profound ripple effect that immersive experiences can have.

Hypothesis 3 introduced a compelling dimension to our study by examining the role of User Perception (UP) in moderating the relationship between the Metaverse (MV) and Immersive Experience (IE). The results of this investigation revealed that User Perception indeed plays a substantial moderating role, with a β value of 0.237 and a significance level of $p < 0.05$. This finding underscores the nuanced and intricate nature of the user's experience within the Metaverse. User Perception, in this context, encompasses a range of factors, including headset comfortability, susceptibility to simulation sickness, prior knowledge of the technology, and ease of use. Although the unit of analysis for this research is user and focus is on perceptions of users about metaverse, it is important to highlight the impact of extrinsic and intrinsic motivation in their engagement with metaverse. From scholarly perspective, aspects such as content, device, technology, strategic approach, and user inputs in combination of personal desires, perceived-value creation and personality characteristics would collectively influence perceptions of users whose engagement is influenced by the immersive content offered by the Metaverse. The significance of headset comfortability became evident through the interviews, with users highlighting discomfort and physical strain associated with

prolonged headset usage. This issue, often linked to the weight, fit, and design of headsets, can significantly impact a user's ability to fully engage in the immersive experience. Consequently, improving the ergonomics and wearability of headsets is crucial for creating a seamless and comfortable immersive experience, especially in extended usage scenarios. Simulation sickness, another aspect of User Perception, emerged as a significant factor affecting the overall immersive encounter. Users reported experiencing symptoms such as headaches, dizziness, and nausea while interacting with the Metaverse. This phenomenon aligns with research in virtual reality and immersive technologies, where simulation sickness has been a recurrent concern. It highlights the need for ongoing research and technological advancements to mitigate these discomforts and expand the accessibility of the Metaverse to a broader audience. Prior knowledge and navigation skills were found to significantly influence immersive experiences. Users with a higher level of familiarity with the technology and its navigation tools tended to have more positive immersive encounters. This emphasizes the importance of user training and education to ensure that users can make the most of their time within the Metaverse. Furthermore, it underscores the need for user-friendly interfaces and intuitive navigation systems that reduce the barriers to entry for newcomers. These findings collectively illuminate the intricate interplay between User Perception and the Immersive Experience in the Metaverse. The user's perception, influenced by comfort, simulation sickness, prior knowledge, and ease of use, acts as a powerful mediator that can enhance or detract from the overall immersive encounter. The Metaverse, as a nascent technology, is still evolving to address these user perception-related challenges.

Other two Hypotheses H4 and H5 introduced a captivating aspect of our research by exploring the mediating role of Hedonic and Utilitarian Values between User Engagement (UE) and Immersive Experience (IE) within the Metaverse. These hypotheses sought to understand how the emotional and practical dimensions of value influence the relationship

between user engagement and immersive experiences. The results confirmed that Hedonic and Utilitarian Values indeed played a partial mediating role, providing further insights into the intricate processes that drive user engagement within the Metaverse. Hedonic Value, which encompasses the enjoyment, fun and entertainment derived from an experience, was found to have a significant impact on user engagement. Users are drawn to immersive experiences within the Metaverse not only for the practical benefits but also because of the sheer pleasure they derive from these experiences. The joy of exploration, the thrill of discovery, and the emotional highs experienced within the virtual world are compelling factors that drive user engagement (Pengnate et al, 2020; Papagiannidis et al 2017). Utilitarian Value, on the other hand, represents the practical benefits and utility users gain from their interactions within the Metaverse. This can include information seeking, perceived usefulness, and decision making. These practical benefits not only enhance user engagement but also serve as a fundamental underpinning for the overall Immersive Experience (Pengnate et al, 2020; Papagiannidis et al 2017). The confirmation of Hedonic and Utilitarian Values as partial mediators emphasizes the complex interplay of emotional and practical elements in user engagement within the Metaverse. It underscores the idea that users are not driven solely by one aspect of value but rather by a dynamic fusion of emotional and practical factors. The qualitative insights gained from interviews further enriched this understanding. Users consistently emphasized the importance of both pleasurable and practical advantages in fostering user engagement. They recounted their immersive experiences with joy and excitement, underlining the emotional highs they experienced. Simultaneously, they discussed the ease of access to information, the convenience of planning within the Metaverse, and the cost-efficiency of virtual travel, highlighting the practical benefits that played a role in shaping their experiences. The implications of these findings are profound. They underscore the need for content creators, businesses, and developers within the Metaverse to craft experiences that not only deliver

practical utility but also evoke emotional responses. The Metaverse is not merely a platform for transactional interactions; it is a space where users seek to be captivated, excited, and emotionally engaged.

RESEARCH CONTRIBUTIONS

To Literature: This research makes significant contribution to the existing literature on the Metaverse, immersive experiences, and user engagement. Firstly, this study reaffirms the importance of Metaverse technologies in fostering immersive experiences, thus adding empirical support to the theoretical frameworks proposed by previous scholars (Tussyadiah et al., 2018; Witmer et al, 1998). Since the introduction of Metaverse by Mark Zuckerberg in October 2021, there is rise in research relating to defining what Metaverse is and how it can revolutionize the industries along with the challenges and opportunities (Buhalis et al, 2023; Dwivedi et al, 2022; Mystakidis, 2021). There is a lack of comprehensive and empirically tested research on the Metaverse's impact on travel and user engagement. By investigating mediating and moderating factors such as hedonic and utilitarian values, as well as user perceptions, this research aims to fill critical knowledge gaps in the field. By providing robust quantitative and qualitative data, it strengthens the understanding of how Metaverse adoption can lead to positive immersive experiences. Furthermore, the study tries to bridge the gap between immersive experiences and user engagement, demonstrating a clear and positive relationship between the two. Previous research has different concepts of user engagement (Carbonell-Carrera et al, 2021; O'Brien et al, 2018; Hamari et al, 2016; Attfield, 2011; Mollen et al, 2010; O'Brien et al 2008; and Fredricks et al, 2004), however, none of them have measured user engagement as WOM, referrals and online reviews. The findings of this research extend the current body of knowledge by emphasizing the transformative impact of immersive experiences in driving user engagement, supported not only by quantitative data but also by extensive literature (Aldaihani, 2023; Allcoat et al., 2021; Arce-Lopera et al., 2021; De Luca

et al., 2022; Flavián et al., 2021; Guldager et al., 2023; Nicolaidou et al., 2023; Verhulst et al., 2021; Xin, 2022). This contribution underscores the importance of immersive Metaverse experiences as catalysts for user engagement in various domains, including tourism and entertainment. Beyond its immediate contributions, this study provides a valuable framework for future research in the Metaverse. The nuanced understanding of the complex interplay between user perception, engagement, and value creates opportunities for in-depth investigations. This foundation paves the way for further exploration in this dynamic and rapidly evolving digital realm. It offers a roadmap for researchers and practitioners to delve deeper into the intricacies of immersive experiences and user engagement within the Metaverse.

To Practice: The study advances the understanding of User Perception (UP) as a moderating factor in the relationship between the Metaverse and immersive experiences. By uncovering the nuanced influence of factors such as headset comfortability, simulation sickness, prior knowledge, and ease of use, it enriches the literature on the intricate dynamics of user experiences in virtual environments (Lee et al., 2020). This insight is essential for guiding the design and development of user centric Metaverse applications, enhancing their accessibility and usability. In practical terms, the research findings have several implications for industry practitioners and businesses operating in the Metaverse and virtual tourism sectors. Firstly, the confirmation of the positive relationship between Metaverse usage and immersive experiences highlights the potential for businesses to leverage Metaverse technologies to enhance user engagement. Companies like booking.com, Expedia, hotels.com can invest in immersive Metaverse experiences to captivate users and, subsequently, drive word-of-mouth (WOM) marketing, referral programs, and online reviews. This can lead to increased brand awareness and customer loyalty, translating into real-world business benefits. Moreover, the study emphasizes the importance of creating high-quality content, including graphics and audio, to

foster immersive experiences. Practitioners can prioritize the development of visually engaging and emotionally resonant virtual environments, aligning with user expectations. In the interviews, participants mentioned that they would like to see hotels having a virtual presence where they can view their rooms before booking along with guided tours. Interviewees were much interested in viewing the surrounding of the hotel and the travel destination within the Metaverse before spending money to book a travel experience in the real world. This approach can maximize user immersion and contribute to positive user perceptions, ultimately driving engagement.

To Policy: The insights into user discomfort and the importance of device comfortability have practical implications for Metaverse hardware and software developers. Focusing on ergonomic design and reducing discomfort associated with VR headsets can enhance user satisfaction and encourage longer usage periods. The interview and survey data clearly shows that a discomfort in the headset and simulation sickness can break their immersion level. Therefore, headset companies can dive into these problems to solve to make users' experiences better. Additionally, the study's exploration of user perception, including issues related to headset comfort and simulation sickness, underscores the need for policies that prioritize user safety and well-being in the Metaverse. Policymakers can use these findings to advocate for and establish safety standards and guidelines for immersive technologies, ensuring that users are protected from adverse physical and mental effects. The research highlights the role of user perception, including factors like ease of use and prior knowledge, in shaping immersive experiences. This calls for policies that promote the accessibility and inclusivity of the Metaverse. Policymakers can work to ensure that Metaverse platforms and content are designed to be user-friendly and inclusive of individuals with varying levels of technological expertise.

LIMITATIONS AND FUTURE RESEARCH

In this research, we acknowledge several limitations that deserve consideration. Firstly, the research does not account for the wide variety of technologies and platforms available within the Metaverse. Different platforms offer unique features and experiences. A more comprehensive investigation across various platforms would provide a more detailed perspective. By limiting the investigation to a specific subset of platforms, the research may not fully capture the breadth and depth of the Metaverse's multifaceted nature. A more comprehensive approach, involving an examination of various platforms, would offer a richer and more detailed perspective on user experiences, allowing for a nuanced understanding of how different technological interfaces and functionalities influence user engagement, perception, and values. This limitation highlights the importance of considering the vast ecosystem of Metaverse platforms to gain a holistic understanding of the diverse and evolving digital landscape that users navigate.

Secondly, the research employed a cross-sectional design, which only captures a glimpse of user experiences at a specific point in time. This approach, similar to taking a single view, fails to account for the dynamic and evolving nature of this virtual environment. The Metaverse, characterized by its rapid technological advancements and constant evolution, needs a more comprehensive understanding that can only be gained through a longitudinal approach. A longitudinal approach, tracking users' experiences over an extended period of time, would offer insights into how these experiences develop. It would shed light on whether user engagement and perceptions become more positive or negative as the users become more familiarised with the Metaverse, as new platforms and technologies emerge, and as the societal perspective evolves. Such an approach is fundamental for capturing the multifaceted and time-dependent nature of user experiences within this ever-evolving digital landscape.

Lastly, the methodology employed in the study is mixed methods containing interviews and surveys which may not be sufficient to provide a comprehensive and in-depth understanding

of user experiences within the Metaverse. While surveys and interviews are valuable tools for gathering self-reported data and subjective insights (Lucia et al., 2007), they do not offer the controlled and experimental conditions necessary to draw causal relationships or isolate specific variables that impact user engagement, perception, and values. Adopting experimental methods or controlled studies would strengthen the research by allowing for a more rigorous examination of the cause-and-effect relationships between the Metaverse, immersive experiences, user engagement, and user perception. Experimental designs could help researchers systematically manipulate variables and test hypotheses to provide a deeper and more empirical understanding of the dynamics at play in the Metaverse.

Future research can explore several exciting avenues to advance our understanding of the Metaverse and its impact on user engagement. Investigating how user engagement, perception, and experiences within the Metaverse evolve over time can provide valuable insights. Longitudinal studies tracking the same users or cohorts over extended periods can reveal whether initial positive immersive experiences are sustained or change over time. Researchers can examine factors that contribute to changes in user engagement, such as evolving technology, content, or user familiarity with the Metaverse.

Moreover, future research can study the role of user-generated content in shaping immersive experiences and user engagement should be explored. Understanding how user-generated content influences social interaction, information sharing, and its broader impact on the Metaverse community can provide valuable insights into the collaborative and participatory nature of this virtual environment. Additionally, capturing user satisfaction through post-interaction surveys or feedback forms can help gauge the level of fulfilment and emotional resonance users derive from their experiences.

Furthermore, the Metaverse is used by a diverse user base. Future research can explore how factors like age, gender, socioeconomic status, and cultural background influence user

experiences and engagement. Investigating whether there are disparities in engagement, perception, and hedonic and utilitarian values among different demographic groups can inform strategies for creating a more inclusive and equitable Metaverse. Additionally, future research can focus on perspective of the provider of metaverse platform which may further be extended to important concepts such as strategically improving customer-focus, technological advancement, stakeholder network building capabilities or inclusivity, evaluating the accessibility of the Metaverse for individuals with disabilities and how it influences their overall experience can provide valuable insights.

CONCLUSION

In conclusion, this study has shed light on the complex relationship of factors within the Metaverse that contribute to the literature for Immersive Experiences (IE) and User Engagement (UE). This research has provided empirical support for the pivotal role of Metaverse technologies in enhancing immersive experience which can lead to better user engagement. From this research, we can say that a user is more likely to spread positive WOM, use referrals and write online reviews after having a positive immersive experience from the use of Metaverse which includes high-quality graphics, avatars, and quality content. Furthermore, it was also proven from the study that a user is more likely to engage through positive WOM, referrals and online reviews if he/she had fun, felts entertained and joy after having a positive immersive experience using Metaverse. Similarly, it was also evident from the study that a user is more likely to engage through positive WOM, referrals and online reviews if he/she had received practical benefits like seeking information, perceived the experience as useful and it helped in decision making after having a positive immersive experience with Metaverse. In summary, this research contributes to our understanding of how the Metaverse, immersive experiences, user engagement, user perception, and hedonic and utilitarian values are interrelated. The findings emphasize the crucial role of immersive

experiences and user perceptions in shaping engagement within the hospitality and tourism industry, highlighting the significance of creating positive and practical virtual environments. As technology continues to advance, these insights will be valuable for businesses and practitioners looking to optimize user experiences in the ever-evolving world of the Metaverse.

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