AN EXAMINATION OF METAVERSE TECHNOLOGY ACCEPTANCE MODEL IN TOURISM

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The traditional definition of tourism has been transformed by significant advancements in communication and information technology. The concept of Metaverse, derived from the words “meta” (meaning beyond) and “verse” (meaning universe), has redefined how people experience travel. This innovative concept combines virtual reality, augmented reality, and artificial intelligence to create virtually augmented spaces. However, the tourism industry should clarify and narrow down the definition of Metaverse and its intriguing concept for its successful adoption in the future. Thus, it is crucial to define Metaverse tourism and understand how users will accept it in the near future. This study aims to comprehend the technology behind Metaverse tourism, review current research on the topic, and identify the critical factors related to experiential Metaverse tourism. The paper also examines how computer self-efficacy, novelty seeking, subjective norm, job relevance, perceived usefulness, perceived ease of use, and perceived enjoyment can influence expected user satisfaction and behavioral intention, given the context of situational motivation. The findings have significant implications for theory and management, addressing various questions related to users' perceptions, expectations, design considerations, stakeholder preparations, and performance assessment of metaverse technology in tourism applications.

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CHAPTER 1

INTRODUCTION

The advances made in communication and information technology have revolutionized the traditional definition of tourism and reshaped it significantly. Specifically, the advent of augmented reality (AR) has facilitated an interactive connection between users and attractions, transforming the way they engage with their surroundings. As a result of these advancements, there has been a growing demand for AR applications that enhance the user's experience by providing augmented information about their surrounding environment.

Recent studies have focused on exploring the applicability of location-based AR systems as a means to enhance the overall quality of the travel experience (Yovcheva, 2015; Jung et al., 2015). The significant advancement of AR in the tourism industry now empowers tourists to get more valuable insights and knowledge during their journeys. There are many cases of AR applications found within the domain of tourism as a whole, including the promotional tools utilized by destination marketing organizations (Lin & Chen, 2017; Obeidy et al., 2017). Notably, various multimedia application devices such as AcrossAir, Google Sky Map, Layar, Lookator, and Spotcrime have been introduced, incorporating AR features. These applications have proven effective in providing valuable guidance and enhancing tourist satisfaction (Obeidy et al., 2017).

The combination of augmented reality (AR) and query answering services (QAS) represents a practical approach to providing tourists with valuable information and enriching their overall experience (Lin & Chen, 2017). By leveraging AR technology, interactive multimedia can be implemented to offer three-dimensional audiovisuals and deliver useful guidance to users. Concurrently, QAS facilitates interaction between users and devices, enabling users to receive contextual information about their destination through language-adjusted query responses. In essence, integrating AR tour media with QAS capabilities can create an intelligent system that effectively promotes tourism destinations.

The term “metaverse” combines “meta” (meaning beyond) and “verse” (referring to the universe) to denote a virtually augmented space (Kim et al., 2014). Smart et al. (2007) proposed that the metaverse can be categorized based on two axes: the horizontal axis of augmented reality (AR) versus simulation, and the vertical axis of internal versus external elements. This classification results in four distinct planes: the virtual world, AR, mirror world, and lifelogging. Augmented reality involves highlighting a specific object and providing information about it. In the metaverse, a virtual world refers to a user's direct experience of an event related to the object, either through their own interaction or via an avatar. Lifelogging refers to the collection of logs capturing individual user events within the system. Analyzing these logs can reveal user behavioral patterns, enabling the delivery of customized content based on data analysis. A mirror world, on the other hand, represents the replication or regeneration of reality.

The proposed metaverse tour platform discussed in this paper involves the essential features of the metaverse, offering users an immersive and experiential journey that seamlessly blends elements of reality and the virtual environment. This platform aims to facilitate the promotion of tourist attractions and cultural experiences in various destinations. To achieve this objective, the study explores the integration of augmented reality (AR) and the metaverse concept in a virtual tour simulation. Additionally, the usage of the metaverse platform is examined within the framework of the elaborated technology acceptance model. By leveraging augmented reality and the metaverse, the virtual tour simulation provided by the platform enables users to engage with destinations and cultural offerings in a highly interactive and realistic manner. The immediate exhibition of both real-world and virtual elements enhances the experiential nature of the journey, allowing users to explore and appreciate different tourist attractions and cultural highlights.

Statement of the Problem

The metaverse revolutionizes the way people engage with travel, offering novel and immersive experiences. It has the potential to expand tourists' perspectives and provide unique opportunities, such as virtually revisiting destinations and discovering hidden gems that may have been missed during physical trips. This virtual exploration opens doors for individuals whose travel options are limited due to economic, political, or physical constraints, allowing them to share in new and exciting experiences. Travel industry leaders must recognize the transformative power of the metaverse and its implications for the future of tourism. It is crucial to contemplate how the metaverse can reshape the travel industry in various ways. In particular, understanding how to effectively target and develop strategies for metaverse tourism becomes essential in establishing future competitiveness.

The objective of this study is to investigate the potential acceptance of metaverse technology among tourists. It seeks to address questions related to how the travel industry can engage with tourists in this context, the range of features that can be offered, and the operational aspects involved. When exploring new technologies, it becomes crucial to examine the readiness of users to embrace them. Previous research has often employed the technology acceptance model (TAM) to assess the reception of the latest technological advancements. Scholars have commonly taken a positivistic approach and incorporated external variables alongside TAM in prior studies.

In order to gain a deeper understanding of users' perception of technology, several scholars have suggested the incorporation of qualitative research methods into the existing technology acceptance model (TAM) (Ayeh et al., 2013; Obeidy et al., 2017). For instance, Jung et al. (2015) proposed a research model to assess the acceptance of augmented reality (AR) and applied relevant variables in the context of mobile services, thereby expanding the AR theory within the metaverse concept. They utilized a qualitative approach to explore potential variables associated with AR acceptance. However, some scholars contend that utilizing such technology in the tourism industry presents uncertainties due to its lack of full establishment (Dieck et al., 2016; Obeidy et al., 2017). From this perspective, it becomes essential to consider tourists' expectations regarding the use of AR-related technology, such as the metaverse, and its potential impact on tourism destinations.

Prior research has highlighted the importance of investigating individual, situational, and technology-specific factors to comprehend the acceptance of emerging technologies (e.g., Lee et al., 2012; Manis & Choi, 2019). Additionally, the reluctance of potential users to adopt new technology may stem from factors such as their readiness for its use or dissatisfaction with the quality of content, such as visual stimuli robustness (Han et al., 2014; Manis & Choi, 2019; Yovcheva, 2015). Hence, there is a strong need to delve into user-specific and situational perspectives to gain a comprehensive understanding of how metaverse tourism will be embraced by users.

Purpose of the Study

The emergence of the metaverse holds the potential to revolutionize multiple aspects of the travel industry, including marketing, human resources, event management, and business strategy (Gerard, 2022). It presents a novel opportunity for individuals to experience destinations beforehand, enabling them to pre-screen and explore locations without the constraints of time and budget. This aspect appeals to both business and leisure travelers, as well as event managers. Virtual travel is rapidly emerging as a transformative medium, as it significantly influences tourists' decision-making while on-site and serves as a powerful instrument for promoting destination information (Lu et al., 2022).

Schaal (2021) noted that global pandemics have spurred demand for virtual media that can fulfill consumers' desire to travel despite limitations in physical mobility. The outbreak of the pandemic introduced a new set of constraints for the tourism industry, as travelers became aware of the risks associated with crowded places, leading some individuals to refrain from leaving their homes (El-Said & Aziz, 2022). This has given rise to new expectations among tourists, who now view virtual tourism as an alternative means of exploring and experiencing destinations without the fear of falling ill.

The metaverse is viewed as a potential replacement for traditional media platforms, such as mobile internet, as it offers users a sense of presence and shared experiences across distant locations. Its impact on the travel industry holds numerous possibilities. One such example is the ability to create avatars using digital objects, which grants tourists the opportunity for self-expression and opens up new avenues for immersive experiences.

Prior research has identified several ways in which virtual reality and the metaverse can enhance the overall quality of travel experiences (Gerard, 2022; Lu et al., 2022; Marr, 2021). First, utilizing the metaverse allows tourists to explore destinations that may be challenging to access directly due to remote locations, potential dangers, or restricted access. An example is the virtual experience of Patagonia provided by Oculus Rift, where individuals can access and appreciate the stunning scenery of Laguna Sucia, a glacier lake nestled at the base of Mount Fitzroy (Marr, 2021). Second, the metaverse enables tourists to virtually explore hotels or destinations before making actual bookings. By vividly showcasing their offerings, destination stakeholders can effectively promote their amenities to potential visitors (Lu et al., 2022). This allows travelers to gather information about the geographical features, such as passages, road systems, and transportation options, as well as local businesses associated with the destination, enabling them to plan their itinerary and budget more effectively. This feature is particularly beneficial for event planners as it enables them to explore destinations in advance, and estimate time, routes, and associated costs for on-site visits (Gerard, 2022). Considering the industry perspective, it becomes valuable to study the factors that connect the experiential value derived from virtual tourism. However, given the concerns surrounding the uncertainty of the metaverse (Dieck et al., 2016; Obeidy et al., 2017), it is critically important to evaluate consumer expectations of the technology and redefine its range and usability within the tourism sector. Therefore, this paper proposes the elaborated metaverse technology acceptance model to examine travelers' technology usage behavior and intentions.

The main objectives of this study are to gain a comprehensive understanding of metaverse tourism technology, particularly its adaptive and context-aware features; review the existing literature on metaverse tourism; and investigate a proposed model that identifies key factors associated with the experiential aspect of metaverse tourism. Specifically, this paper examines the influence of computer self-efficacy, novelty seeking, subjective norm, job relevance, perceived usefulness, perceived ease of use, and perceived enjoyment on user satisfaction and intention.

Research Questions

This study adopts a quantitative research approach to explore and generate valuable insights. This research aims to provide more systematic implications. The primary focus is to examine the prevailing influence of online communication and technology in the tourism industry, along with the application and implications of advanced technologies such as augmented reality (AR), artificial intelligence (AI), and virtual reality (VR) in relation to the metaverse. Given the diverse and rapidly evolving demands of tourists, it is crucial to investigate user acceptance and identify the potential of emerging technologies like the metaverse. To address the theoretical gaps in existing literature, this study aims to address the following key research questions and their associated components:

RQ1: What is the users' perception regarding the feasibility of metaverse technology in tourism applications?

RQ2: What do users expect when utilizing the potential metaverse technology in the tourism industry?

RQ3: How should the metaverse tour platform be designed and tailored to effectively meet the needs and expectations of users?

RQ4: What types of preparations should be undertaken by stakeholders to successfully design and implement tourism metaverse?

RQ5: How can destination stakeholders assess the performance and effectiveness of the metaverse tour platform?

Significance of the Study

Advances in technology including artificial intelligence and augmented reality has redefined the traditional meaning of tourism and created interest in applying the metaverse concept in tourism development. This study has reviewed various studies (e.g., Jung et al., 2015; Lin & Chen, 2017; Obeidy et al., 2017; Yovcheva, 2015), which explored the applicability of metaverse-related technology to enhance the quality of tourism experience in terms of knowledge, user-guidance, awareness, and satisfaction. The application of metaverse in tourism development can promote tourism destinations effectively through language queries, intelligent systems, and assimilated spaces.

This study has investigated the acceptance, applicability, and usability to understand how users perceive and interact with metaverse tourism. It is essential to examine whether tourists are ready to use the technology when evaluating the feasibility of the new system. This study has explored the acknowledgment and potential of metaverse technology in tourism through the model implementation of elaborated technology acceptance. This approach can assess tourists' expectations of using the metaverse and its influence on destinations by considering individual, situational, and technology-specific factors.

This study builds upon existing literature on augmented reality and technology acceptance by exploring the metaverse concept within the context of tourism. While the metaverse is seen as an innovative concept that combines artificial intelligence, augmented reality, and virtual reality, it requires further clarification and a focused understanding specifically within the realm of tourism. Therefore, it is essential to define the concept of metaverse tourism and examine how users are likely to accept it in the near future. This study addresses this question and provides actionable insights to advance our understanding of this field.

Definition of Terms

- *Artificial intelligence (AI)*: Computer systems that simulate human intelligence
- *Augmented reality (AR)*: A technology that combines the real world with computer-generated virtual elements
- *Computer self-efficacy (SE)*: Individuals' perceived competence and confidence in using emerging technologies
- *Job relevance (JR)*: The extent to which a technology is perceived to be relevant and applicable to an individual's job or work context

- *Metaverse*: An interconnected network of virtual worlds facilitated by virtual reality and augmented reality technology, providing users with the ability to engage in various activities (e.g., business meetings, shopping, concerts, sightseeing) that mirror real-life experiences
- *Novelty seeking (NS)*: The tendency of individuals to actively seek out and explore novel and innovative experiences or technologies
- *Perceived ease-of-use (PEU)*: Individuals' belief that using a particular technology requires minimal effort and is user-friendly
- *Perceived enjoyment (PEJ)*: The extent to which users experience pleasure and satisfaction while using a specific information technology
- *Perceived usefulness (PU)*: Individuals' belief that using a specific technology will enhance their performance in completing tasks
- *Subjective norm (SNORM)*: The perceived social pressure and influence from others that affect an individual's intention to adopt and use a particular technology
- *Technology acceptance model (TAM)*: A theoretical framework that explains users' acceptance and adoption of new technologies based on their perceptions of usefulness and ease of use
- *Virtual reality (VR)*: Computer-generated simulated environments that immerse users in virtual scenes and objects

Limitations

The proposed research study utilized a quantitative approach incorporating both traditional and elaborated acceptance theories. However, it is important to acknowledge that this study has certain limitations. Firstly, the quantitative aspect of the study, which involved a user survey, carries the possibility of response bias (Krathwohl, 2009), indicating the need for future studies to include follow-up surveys and interviews to gather more comprehensive insights. Secondly, the data collection process may have limitations in terms of sample size and regional bias. To enhance the generalizability of the findings, future studies should aim to include participants with a broader range of socio-demographic characteristics. Thirdly, there is a potential for systematic bias throughout the literature review, data analysis, and findings. To mitigate this, the study employed triangulation of findings and reflexive approaches to ensure reliability, dependability, and consistency. Addressing these aspects and incorporating them into the current model will lead to more insightful discussions on the acceptance of new technology in the field of tourism.

Summary of the Study

The main objective of this study was to investigate the user acceptance of metaverse tourism by examining the relationships between various factors such as computer self-efficacy, perceived usefulness, perceived ease-of-use, perceived enjoyment, situational motivations, satisfaction, and intention. The term "metaverse" refers to an artificially generated and augmented universe that exists beyond reality. It involves the characteristics of four planes: the virtual world, augmented reality (AR), mirror world, and lifelogging, creating an interactive space through interconnected user experiences.

Literature reviews have highlighted the potential of the metaverse to revolutionize the current system by providing users with a sense of being in the same distant place as others, leading to various prospects for its impact on the travel industry. This study proposed that a metaverse tour platform can offer users an experiential journey by seamlessly blending elements of reality and virtual environments.

To explore the users’ acceptance of this technological innovation (i.e., the metaverse), this study employed the technology acceptance theory and examined users' readiness to embrace it. It also emphasized the importance of understanding tourists' expectations regarding metaverse tourism and its impact on destinations. Drawing on individual, situational, and technology-specific factors, the study sought to evaluate consumers' expectations of the metaverse and redefine its range and usability within the tourism sector.

CHAPTER 2

LITERATURE REVIEW

This chapter introduces the critical reviews of relevant studies recently published in artificial intelligence, augmented reality, tourism, and metaverse since 2013. The critiques follow the historical overview of the metaverse and related technological applications across various fields. Table 1 summarizes the conceptual development of the metaverse and its user acceptance.

Table 1

Conceptual Development of Metaverse

Author(s)	Highlights
Dionisio et al. (2013)	This study summarized the potency of virtual worlds by narrowing down the concepts and elements of the technology. This study introduced the current status and possibilities of 3D virtual worlds and the metaverse.
Choi & Kim (2017)	This study focused on the general schema of the metaverse system in the context of the museum exhibition. This study suggested a plan of content service deployment for the metaverse museum and the concepts of beacons and head-mount devices.
Lin & Chen (2017)	This study applied the uses and gratifications theory to accepting augmented reality technology in the tourism review. This study emphasized the usage behavior of the tour-sharing application.
Chao (2019)	This study suggested the unified acceptance of mobile learning regarding user efficacy, usability, usefulness, and enjoyment. This study introduced various factors determining the behavioral intention of technology usage.
Ning et al. (2021)	Based on the survey analysis, this study summarized the developmental stage, technological framework, characteristics, applications, and challenges for the practical evaluations of the metaverse.
Kim (2021)	This study focused on using the metaverse platform for cultural content matching and management.
Zaman et al. (2022)	This study examined the relationships between situational factors of technology acceptance and tourists' readiness for metaverse tourism. Several concepts such as digital twin, tech-savviness, technology anxiety, and fear of missing out were discussed.
Wei (2022)	This study outlined the background reviews of blockchain-based tourism and metaverse. This study discussed professional certification of related technology and industry ecosystem.
Gursoy et al. (2022)	This study summarized the business perspectives of metaverse tourism and current trends and directions in consumer attitude and marketing research.

(table continues)

Author(s)	Highlights
Park & Kim (2022)	This study categorizes the concepts and crucial technologies required for actualizing the metaverse into three main elements: hardware, software, and contents. Additionally, it identifies three key methods: application, implementation, and user interaction. The paper then provides a comprehensive overview of the limitations and future directions to implement the immersive metaverse, considering factors such as challenges, constraints, and social influences.
Yang & Wang (2023)	This paper conceptualizes the evolution of the metaverse, encompassing its past, present, and future, with a specific emphasis on its implications in the tourism domain. This paper describes the fundamental technologies utilized in metaverse applications and establishes the investigation of the fusion between reality and virtuality.

The literature review explores the definition and development of the metaverse concept, indicates the application of metaverse technology in the tourism sector, and introduces the theory of technology acceptance and its primary elements. The primary constructs and the hypotheses development are discussed.

Review of Metaverse Study

Dionisio et al. (2013) conducted a comprehensive examination of 3D virtual worlds and the metaverse, shedding light on their current state and future possibilities. The authors outlined the concept of virtual reality and the metaverse, emphasizing the importance of understanding the specific requirements for integrating independent virtual realms into a cohesive metaverse. They discussed four fundamental elements—realism, ubiquity, interoperability, and scalability—that are central to the development of the metaverse, illustrating how these elements contribute to the evolution from virtual worlds to the expansive concept of the metaverse. The historical development of terms related to virtual worlds, including the delineation of five phases, and advancements in computing were closely examined to establish a comprehensive understanding of the metaverse. Dionisio et al. (2013) suggested that contemporary virtual worlds provide immersive contexts that offer users realistic experiences and elaborate environments for socio-cultural interactions within the digitally connected realm. Moreover, the study introduced practical implications by highlighting potential barriers to implementing the metaverse and related technologies from conceptual, computational, economic, and political perspectives. This valuable insight contributes to a deeper understanding of the challenges that should be addressed to fully realize the metaverse's potential. Dionisio et al. (2013) further emphasized the importance of narrowing down the terminology associated with the metaverse and identifying its core elements. The elements of realism, ubiquity, interoperability, and scalability were identified as critical components in establishing the experiential quality of the metaverse tourism atmosphere. These findings offer valuable guidance for researchers, developers, and practitioners seeking to create immersive and transformative metaverse experiences within the tourism domain.

Choi and Kim (2017) described a strategy for implementing content services specifically tailored for metaverse museum exhibitions. The researchers introduced virtual exhibition services that leverage smart technologies such as beacons and head-mounted displays (HMDs) to enhance the delivery and expansion of experiential content in museums through augmented reality. They emphasized the significance of storytelling in advancing the quality of experience scenarios facilitated by these technologies. To provide valuable insights into enhancing spectator experiences through the integration of smart technologies, this study delved into the history and current state of ubiquity within the context of museum exhibitions. By addressing the technological limitations that hinder the current state of museum experiences, the researchers proposed the design of a service, including a content management system, to optimize the quality of experiences in virtual museum exhibitions. Choi and Kim (2017) presented a meaningful implication by introducing the overall schema of the metaverse system. This schema involves the interactive processes involving users, devices, networks, and content, thus providing a comprehensive understanding of the metaverse's underlying structure. The researchers also visually depicted the behavioral characteristics of potential metaverse users, contributing to a better understanding of the essential elements required for successful technology implementation.

Lin and Chen (2017) focused on examining the usage pattern of an augmented reality tourism application through the lens of the uses and gratifications theory. The researchers specifically investigated the applicability of an intelligent tourism application and a query-answering service (QAS) utilizing augmented reality, using the case of Hakka culture in Thailand as a basis for exploration. The study aimed to uncover how this application could facilitate attraction navigation by employing the observation of random neural networks. The investigation centered on understanding the technology acceptance of tour-sharing applications and estimating user attitudes, usage intentions, and gratifications. Notable findings from the study included the direct and significant effects of self-presentation and perceived usefulness on gratification. Additionally, perceived entertainment was found to have an indirect yet significant effect on gratification through perceived ease of use. The positive significance of gratification was identified in relation to usage intentions and attitudes toward the destinations. These findings hold implications for destination stakeholders involved in promoting the Hakka destination, emphasizing the importance of cultural aspects, self-presentation, and information sharing. The study also shed light on several challenges associated with the adoption of augmented reality in the tourism context, such as technological complexities and standardization issues. Lin and Chen (2017) offered a practical implication by illustrating how augmented reality can be applied in the context of technology acceptance and tourism. Their research provides insights into how tourists perceive and utilize this newly adopted virtual technology.

Obeidy et al. (2017) investigated the adoption of augmented reality in tourism through smart glasses. The study aimed to provide an in-depth understanding of the acceptance model for augmented reality among tourists utilizing smart glass technology, specifically in the context of cultural heritage tourism. The researchers explored the application of augmented reality in cultural tourism and its potential when combined with smart glasses. To capture important dimensions related to user behavior and visiting intentions, the study investigated the influence of technology readiness, information quality, facilitating conditions, and visual appeal. By exploring these factors, the researchers aimed to gain insights into the acceptance of augmented reality by users and the implications for its implementation in cultural tourism. The study highlighted the significance of evaluating user acceptance when measuring the potential of emerging technologies. This evaluation process can help identify potential hurdles and provide valuable insights for the development of necessary specifications in terms of interface, hardware, and design. Obeidy et al. (2017) contributed to the field by offering implications regarding alternative variables in technology acceptance. These variables hold the potential for informing extrinsic design perspectives, such as aesthetic and hedonic features. By considering these factors, the study aids in understanding how the design and presentation of augmented reality experiences can enhance user acceptance and satisfaction.

Chao (2019) examined the factors that influence the behavioral intention to use mobile learning, utilizing a unified acceptance model. The study aimed to understand the adoption of technology in the context of online education by investigating students' attitudes and behaviors toward mobile learning. By extending the technology acceptance model and employing the unified theory of acceptance and use of technology (UTAUT), the research explored various perspectives of students, including mobile self-efficacy, perceived enjoyment, trust, satisfaction, and perceived risk as moderators. The results of the study revealed several significant findings. It highlighted the importance of satisfaction, trust, and performance expectancy in influencing behavioral intention. Furthermore, it identified the direct positive effects of perceived enjoyment on behavioral intention. Additionally, the study unveiled the moderating role of perceived risk in the relationship between performance expectancy and behavioral intention. These findings hold implications for understanding the key factors in the acceptance of mobile technology and showcase the pedagogical applicability of such technology. Chao (2019) expanded the conceptual scope of technology acceptance by incorporating additional factors and dimensions into the analysis. By considering usability, usefulness, and enjoyment as indicators of user efficacy, the study sheds light on the process through which individuals develop a positive perception of mobile learning and its outcomes.

Ning et al. (2021) presented a comprehensive exploration of the metaverse, including its developmental stage, technological framework, characteristics, applications, and challenges. The research delved into various perspectives, such as network infrastructure, virtual convergence, and multi-technology dominance, to propose a comprehensive understanding of the metaverse. The study highlighted the key characteristics of the metaverse, including its multi-technology dominance, sociality, and hyperspace. It discussed the convergence of multiple technologies, presenting a technology roadmap that involved communication and computing infrastructure, management technology, fundamental technology, object connection, and space convergence. Furthermore, the research addressed the social aspects of the metaverse, examining virtual social worlds, privacy schemes, and the unique time-space nature of the technology. By analyzing the current status of the metaverse, the study provided insights into its applicable areas and identified potential challenges. These findings contribute to a deeper understanding of the metaverse and its implications for various industries. Additionally, Ning et al. (2021) offered practical implications based on their industrial review, presenting a comprehensive summary of the technological backgrounds associated with the metaverse.

Kim (2021) focused on exploring a metaverse-based platform that facilitates the matching and immersive experience of cultural content. The author acknowledged the increased attention given to virtual-centered services, including non-face-to-face meetings and virtual reality, due to the pandemic's impact across various industries. The research introduced the workflow of the metaverse matching platform, highlighting its key components and processes. The cultural content data, sourced from museums and exhibitions, is pre-collected and made available within the platform. Tourists then have the ability to select content based on their preferences and interests. The usage information of tourists is transmitted to the matching management system, which effectively manages this data for future users, enabling the modification of matching conditions to enhance the quality of the experience. These processes are seamlessly integrated with the concepts of the metaverse, cultural content service, and cloud computing. The paper presented the main platform system, which relies on the transmission of information through the user's mobile device, system server, database, keyword matching, and avatar creation. Additionally, the study detailed how the management system handles membership-related information through user selection properties and system components, as depicted in the flow chart. Kim (2021) provided a comprehensive and detailed workflow of a metaverse platform system that efficiently transfers preset cultural contents and user-generated information to the data storage and feedback mechanisms. By elucidating the intricacies of the platform's operation, the study contributes to a better understanding of how the metaverse can be leveraged to enhance the matching and immersive experience of cultural content.

Zaman et al. (2022) examined the connections between international tourists' travel anxiety related to the COVID-19 pandemic and their readiness to engage in metaverse space travel. The research highlighted the psychological impact of the pandemic on tourists' decision-making processes, particularly in terms of health risk perceptions and self-protection motives. The study underscored the shifting preferences among tourists, as they increasingly turn to metaverse tourism as a means to mitigate travel-related anxiety. It was observed that some tourists who are less adaptable to technology may exhibit less interest in metaverse space travel. On the other hand, those who possess the ability to interact with and comprehend current technologies (i.e., tech savviness) are more likely to embrace metaverse tourism. Furthermore, tourists who are not concerned about missing out on travel opportunities may choose to wait until the pandemic subsides and are therefore less inclined to utilize new technologies. Conversely, individuals who fear missing out on travel experiences may be eager to explore alternatives such as metaverse tourism. Thus, factors such as tech savviness and the fear of missing out play crucial roles as moderating factors between travel anxiety and the readiness to adopt metaverse travel. The authors discovered a significant positive relationship between tourists' COVID-19 anxiety and their readiness to engage in metaverse space travel. The presence of tech savviness and the fear of missing out were identified as significant moderators in the relationship between travel anxiety and readiness. Zaman et al. (2022) provided valuable insights into the potential factors influencing situational technology acceptance, such as tech savviness and the fear of missing out. These factors can facilitate tourists' adoption of the metaverse as an alternative to traditional travel during the pandemic. The study sheds light on the complex dynamics between travel anxiety, readiness for metaverse travel, and the role of individual characteristics, thus offering implications for both researchers and practitioners in understanding and leveraging the metaverse in the context of the ongoing global health crisis.

Wei (2022) introduced a blockchain-based tourism platform designed to create immersive metaverse experiences for the general public. The study delved into the historical development, recent advancements, and three key developmental stages of this blockchain-based platform, aiming to facilitate tourism promotions. By addressing the limitations of traditional tourism, such as difficulties in motivating revisits and offering new activities, the application of blockchain technology in smart tourism was explored. Smart tourism, enabled by blockchain technology, offers advantages in terms of real-time modeling, visualization, and operational efficiency. It facilitates the integration of both physical and intangible destination resources, enriching the on-site experience for tourists. The study identified various potential applications of blockchain in smart tourism, including tourism finance, travel credit, tourism services, demand and supply chain management, tourism governance, and government measures. It highlighted the intrinsic relationship between blockchain and the metaverse, emphasizing that while blockchain serves as a critical carrier and incubator for developing metaverse technologies, the concept of the metaverse itself is more comprehensive. The study also discussed several related industries that intersect with the blockchain-based metaverse platform, such as professional certification, e-learning, the online travel market, virtual reality, artificial intelligence, and big data. To provide practical insights, the author outlined the developmental stages of the blockchain-based metaverse platform, known as Gemiverse, and presented its system architecture and operational processes. Wei's (2022) literature and industrial review offered a comprehensive background on the metaverse and blockchain, shedding light on the evolving landscape of immersive experiences and their technological foundations. The study provided a valuable resource for understanding the interplay between blockchain and the metaverse, showcasing the potential of this innovative platform in revolutionizing the tourism industry.

Gursoy et al. (2022) conducted a comprehensive examination of the current trends and future directions of the metaverse within the tourism industry. Within the context of the tourism industry, this study explored the overall landscape of the metaverse, conceptual frameworks, and identified areas for further research. The global pandemic and technological advancements have profoundly impacted the international hospitality and tourism sector, leading to the emergence of the metaverse. Consequently, this study proposed a two-dimensional framework for metaverse travel experiences, which involved a matrix combining interactivity (high vs. low) and motives (hedonic vs. functional). This framework offered practical implications and actionable strategies for service providers and customer managers. In terms of the research agenda, the study categorized potential concerns into three sections: presenting metaverse experiences, understanding the potential shifts in tourist behavior, and establishing effective strategies. These categories raised critical questions relating to prioritizing virtual experiences for tourists, analyzing behavioral patterns, evaluating the impact of virtual goods, assessing the effectiveness of virtual promotion, and exploring metaverse monetization strategies. Gursoy et al. (2022) introduced valuable insights into the business perspectives of metaverse tourism and addressed concurrent issues regarding consumer attitudes, experiences, marketing, and operations. This study serves as a significant resource for industry professionals and researchers seeking to navigate the evolving landscape of the metaverse within the tourism industry.

Buhalis and Karatay (2022) conducted an in-depth exploration of mixed reality and the metaverse in the context of cultural heritage tourism, with a specific focus on the perspectives of Generation Z participants. The study aimed to understand how immersive technologies can be utilized by Generation Z for cultural heritage tourism experiences. It introduced the conceptual backgrounds of virtual reality, augmented reality, and mixed reality, highlighting their distinctions. Mixed reality, in particular, was identified as a technology capable of enhancing the overall tourist experience in cultural and heritage tourism through narrative user engagement, interaction with historical content, and the integration of physical and intangible elements. Employing an exploratory approach, the study evaluated the core elements of mixed reality within the context of cultural tourism. Online-based interviews were conducted to gather insights on user experiences, expectations, intentions, and other thoughts regarding the application of mixed reality technology in tourism. The interview results were thoroughly analyzed, focusing on aspects such as the development of usable cultural heritage, participants' perspectives, willingness to adopt the technology, and future prospects. The study revealed a strong demand for the modernization of cultural heritage sites through the integration of mixed reality technologies, aiming to enhance consumer experiences. To attract Generation Z participants, it was suggested to offer more dynamic experiences and employ gamification approaches. Buhalis and Karatay (2022) provided meaningful implications by shedding light on the perceptions of potential metaverse users, particularly Generation Z, regarding cultural heritage tourism and their virtual on-site experiences and interactions.

Definition of Metaverse

The metaverse is a mutually allocated virtual space generated by the physical combination of augmented virtual reality and constant virtual space, together with the aggregation of enhanced reality and virtual realms (Smart et al., 2007). This terminology was inspired by Neal Stephenson's science fiction Snow Crash (Grimshaw, 2014). As a metaphor for reality, users are projected to be avatars and intermingle with various agents in a multi-dimensional virtual space. The metaverse is a mixture of the terms "meta" and "universe" to symbolize the conjunction of virtual and augmented reality (Kim et al., 2014). The primary linear axes of the metaverse contain augmented reality and simulation versus internal and external elements, producing four distinguished components such as lifelogging, virtual world, mirror world, and augmented reality (Smart et al., 2007). The metaverse is a computerized universe, distinctive from spiritual or metaphysical notions of domains (Dionisio et al., 2013). The metaverse consists of immersive space across three-dimensional representation, distinguished from the traditional concept of cyberspace.

There have been discussions in progress about what the metaverse exactly means and how to distinguish it from what people already experience nowadays. Previous studies have conducted ongoing discussions to conceptualize a specific definition of the terminology (e.g., Dionisio et al., 2013; Ning et al., 2021). For instance, Dionisio et al. (2013) summarized the potency of virtual worlds by narrowing down the concepts and elements of the technology. In addition, Ning et al. (2021) reviewed the developmental stage, technological framework, characteristics, applications, and challenges for the practical evaluations of the metaverse. In summary, the metaverse is a virtual environment designed to be a simulation of the real world through interactive communication.

Dionisio et al. (2013) identified four fundamental characteristics of the metaverse:

realism, ubiquity, interoperability, and scalability. Realism pertains to the extent to which the virtual space accurately represents reality, allowing users to become fully immersed in an alternative domain emotionally and psychologically. Ubiquity focuses on ensuring that the virtual space is accessible across various devices (e.g., desktops, tablets, mobile, etc.) and enables users to maintain their virtual identity and persona seamlessly through information transfer. Interoperability refers to the implementation of compatible digital resources within the virtual space, facilitating the creation of immersive environments and allowing users to freely navigate and interact without interruptions. Scalability addresses the capability of the server infrastructure to handle a large number of users within the metaverse while maintaining the effectiveness of the technology and the user experience. These four key features serve as the core components in establishing a roadmap for the metaverse tour platform, as they shape the foundation for creating a comprehensive and engaging virtual experience for users.

Considering these attributes, the present study aims to explore the current state of technology and its application in constructing a metaverse for the tourism industry. I delve into the necessary advancements to transform independent virtual realms into an interconnected network within the metaverse, fostering immersive and interactive user experiences. By examining the metaverse within the context of tourism, this study contributes to the theoretical comprehension of consumer acceptance of emerging technologies. Furthermore, it provides practical insights and identify challenges in implementing the metaverse as a promising medium for enhancing tourism experiences.

Features of Metaverse

The features of the metaverse consist of immersive experiences, avatars, tangibility, reconnection, and an extended world (Koo et al., 2022; Park & Kim, 2022). The immersive experience allows the user interaction with technology that connects one's presence to the virtual environment. Avatars represent a modified ego, personalities, and medium that enable users to interact with virtual elements. Tangibility is the physical presence of an object that allows users to have a pre-screening experience. Reconnection emphasizes the strengthened relationships between virtual elements and reality. The extended world represents a combination of the characteristics of virtual and augmented reality that allows consumers to immerse themselves in virtual space with the overlay of augmented components.

The metaverse provides an immersive experience, the degree of interaction through the virtual environment (Davis et al., 2009). Users can interact and communicate with each other through a variety of technology. Immersive experiences are represented visually through avatars, voices, gestures, and facial expressions (Koo et al., 2022). Representation of an avatar includes the interaction with virtual environments, which influences the user's sense of being and self-presence (Davis et al., 2009). In the metaverse, users can chat, learn, relax, and work through the simulation of reality. The technological advancement of virtual environments can enhance the degree of self-presence and perceived connectivity to the virtual world (Koo et al., 2022). Peer-to-peer interactions would simulate actual situations (e.g., visiting a destination, watching a performance, running in the park), where artificial and virtual reality components are combined to allow users to experience without physical constraints. One's desire and motivation for a new experience (e.g., novelty-seeking behavior) are related to immersive interactions through virtual technology (Talukdar & Yu, 2021).

The metaverse allows users to create virtual personalities using avatars (Koo et al., 2022; Park & Kim, 2022). An avatar represents a modified ego, originating from the idea that a fundamental being transformed its shape into a human. It was previously utilized as a pre-determined figure in the virtual world, but it now reflects one's distinctive personality, ego, and appearance and performs a social role (Park & Kim, 2022). Users can customize their appearance and surroundings through the use of avatars (Koo et al., 2022). For instance, people can utilize avatar costumes and items to represent their social identity. The social meaning of the virtual space is regarded as important to the tech-savvy generation because they equate their virtual identity with their real counterparts (Park & Kim, 2022). Understanding the role of an avatar in expressing one's role and identity is important to establish a platform for satisfying virtual traveling experiences (Takano & Taka, 2022). Previous studies have emphasized a complementary interaction between personal and environmental elements of virtual tourism and experiences on avatars are highly dependent on user attitudes and behaviors within the specific contexts (Koo et al., 2022; Schrader, 2019). An avatar is the primary topic of the metaverse and holds a related implication to digital twins (Park & Kim, 2022). It is utilized to build instruments in the virtual space and forecast results in advance through simulated situations. The technology processes data representing contexts of different tangible elements to identify the operation status and optimizes the physical aspects of virtual space to enhance its operational performance. In other words, an avatar is a symbolic representation of the virtual ego, which is either used to simulate problems or build an ideal identity that cannot be realized in actual life.

The metaverse offers customers the opportunity to engage with tangible services, as highlighted in recent research (Koo et al., 2022). Previous studies have emphasized the importance of practical expectations in shaping tourists' decision-making process (Fan et al., 2022; Scholl-Grissemann et al., 2020). However, the intangible nature of tourism poses challenges as consumers are unable to experience the exact features of their travel beforehand. Although efforts have been made to provide tangible service evaluations through videos, online reviews, and awards, these methods do not directly help tourists form reliable service expectations (Hossain et al., 2022). In contrast, the metaverse can bridge this gap by providing pre-visit simulations and post-visit replications in a virtual space, enabling tourists to connect with realistic travel experiences (Fan et al., 2022). This feature allows tourists to explore and modify their journey, including choices related to lodging, routes, and destinations, to optimize their experiential quality. In comparison to traditional approaches, the metaverse offers a potentially more effective means for tourists to preview and plan their visit (Koo et al., 2022).

The metaverse serves as a platform to reconnect and strengthen the relationship between virtual space and reality (Koo et al., 2022). Acting as a novel model, the metaverse facilitates real-life business activities by bringing people and organizations together within the virtual space (Shen et al., 2021). Its purpose is to enable global interactions via a virtual environment and avatars, while concurrently supporting unified communication (Dwivedi et al., 2022). The seamless transition and synchronous experience within the virtual space can inspire users to reconnect their perception and cognition, leading to the generation of innovative business ideas (Dwivedi et al., 2022; Gursoy et al., 2022). In the context of metaverse tourism, this means that virtual space can be reconnected to the actual destination, enabling tourists to immerse themselves in imaginative and immersive experiences (Koo et al., 2022).

The metaverse is distinguished by its ability to provide users with an extended experience within the virtual world. This extended reality is built upon the technological foundations of virtual and augmented reality (Park & Kim, 2022). Virtual reality, powered by avatars and observed from a third-person perspective, creates a digitally constructed space that surpasses the limitations of physical human experience. On the other hand, augmented reality overlays virtual objects, such as 3D images and sequences, onto real-world environments, offering a first-person perspective (Avila, 2017; Oddone, 2019). Extended reality combines elements from both virtual and augmented reality, enabling tourists to immerse themselves in a virtual space while experiencing augmented components. This approach enhances the perceived realism for users, providing reactive and immersive sensations, all while minimizing physical fatigue (Park & Kim, 2022).

Metaverse Devices

Metaverse devices play a crucial role in creating an immersive experience within the boundaries of technology. These devices have undergone significant technical advancements, although there is still room for improvement in representing reality accurately (Park & Kim, 2022). Among the essential hardware components of the metaverse, the head-mounted device (HMD) stands out as it enables users to fully engage in the virtual space. To enhance the visual experience, researchers have proposed fovea rendering devices that prioritize high-resolution rendering in areas aligned with human vision, resulting in a more vivid visual encounter (Birnie et al., 2021). Factors such as resolution, vision range, and latency are critical for the performance of physical sensors and devices. Latency, in particular, holds great importance for multimodal interactions, necessitating careful consideration in the design process to minimize side effects and ensure appropriate time intervals.

The HMD displays an image and moderates the background of sound effects through the multifaceted system (Choi & Kim, 2017). As a fundamental in- and output system of the metaverse, HMD is categorized into various designs such as non-see-through, optical-see-through, and visual-see-though (Ruffner et al., 2004). By covering up the screen, HMD provides an immersive experience of augmented space. The design of optical-see-through overlays the virtual processing, which requires a relatively higher specification of the hardware system. The design of video-see-through can complement optical-see-through to produce a more advanced display. HMD follows the headset's movement to trace the user's position and produces the alteration of viewpoints through the movement of the screen. Although it is relatively inaccurate compared to external motion estimation, HMD is frequently used because of the reduced cost and space requirement.

A hand-based input device utilizes more diverse circular coordination and input area (Li et al., 2021). Comprehensive sensor modeling such as grip prediction is required to deliver the tactile feeling of the virtual element. A passive haptic produces the texture of real objects that allows improved awareness of the situation. An active haptic utilizes virtual pressure for more direct interaction by coordinating user feedback. Physical and operational scale in an augmented setting enhances the vividity of user experience, while a robotized interaction produces more diverse interfaces (Bouzbib et al., 2021). The input device can be installed in and outside the hand and utilize various ways (e.g., muscle tension) to deliver the feeling of the virtual element.

Auxiliary input methods can recognize head or eye movement and voices (Foy et al., 2021). Eye-tracking can alternate the point of view by representing eye movement instead of following head orientation. Eye-tracking enables the system to recognize the type of virtual object the user focuses on. This method is advantageous in optimizing the high-resolution image processor for the section where the user is zooming in. The arm overlay technology can provide more predictable and reliable display output (Birnie et al., 2021).

Voice input can handle a larger volume of verbal communication (e.g., texts and conversations) using a virtual keyboard, regardless of the environment that restricts the amount of input.

A treadmill or body tracking can analyze more accurate motion through auxiliary devices that trace users' perceptions of space and gravity (Park & Kim, 2022). Motion input methods operate in either active or passive ways. The passive way utilizes a fixed scenario, while the active way represents behavioral feedback flexibly. Various approaches (e.g., 360-degree rotation) are being addressed to provide a realistic experience. In addition, the motion-based methods inherently pose a risk of injury, which requires some precautions (e.g., fixed waist around the treadmill handle).

Metaverse Environment

The presence of a cognitive illusion is pivotal in ensuring the high quality of the immersive experience, encompassing both the objective (augmented component) and subjective reality (user perception) of the virtual space (Park & Kim, 2022). User cognition can manifest itself in two primary directions, namely static and dynamic (Ren et al., 2021). Static cognition refers to the recognition of stimuli generated within the organism (i.e., the user), such as visual, auditory, and tactile inputs. On the other hand, dynamic cognition is stimulated by body orientation, movement, and position. Processing information related to active movements, including attention, behavior, and adaptation, holds significant importance for dynamic cognition. The focal points of cognition can be categorized into objects and the environment (Park & Kim, 2022). To enhance the user's cognitive experience, it is crucial to address the level of distortion in the recognition process. Various factors can contribute to reducing distortion, such as adjusting the kernel structure and enhancing input. Object recognition methods involve analyzing multi-point body stimuli, including facial expressions, gestures, positions, and gazes, to understand the process of identification, recording, and tracking.

The stimulation can be processed either proximally or remotely (Park & Kim, 2022). This process can be based on the retrieval of sensory input to create stimuli perceptions (i.e., bottom-up) or the interpretation of stimuli based on preset information (i.e., top-down). The presence of distinction in sensory movement can determine the types of emotional and behavioral processes in repetitive recognition (Park & Kim, 2022).

The creation of an avatar plays an essential part in the metaverse because it represents the imitated reaction through virtual animation (Park & Kim, 2022). For instance, user poses can be analyzed by vision-based approaches (e.g., facial contour and 3D gaze estimation), which interpret the patterns of gestures and gaze. Virtual objects are recognized by the estimation of the position, shape, size, distance, and colors of the entity (Park & Kim, 2022). Various approaches utilize model configuration, scene graph generation, and cross-model attention to process object and background recognition (Ren et al., 2021). The scene is recognized by the elements and structures of the present background. Scene graphs allow the description of augmented properties and compensate for the estimation of neural network recognition. This approach can categorize overlaps of distinct object bodies and predict entities behind the blocks. Similarly, the sub-scene graph is created by the clustering of the object that shares representative pairs of characteristics (Li et al., 2018). On the other hand, object recognition emphasizes human-based items such as human gestures and gaze, and this approach enhances the amount of computation to predict individual objects. To mitigate the computation burden, an object abstraction is required to recognize representative characteristics.

The recognition of speech and sounds allows the system to interact with avatars (Park & Kim, 2022). Through the recognition of conversation, users directly communicate with other avatars and deliver instructions to non-playable entities. To deliver the conversation regardless of the external noise, it is important to separate user speeches and surrounding sounds. Distance between avatars can influence the recognition of speech. Thus, it is necessary to adjust the voice recognition in accordance with various constraints to establish a more realistic augmented metaverse environment.

Metaverse creates the objects and environment by representing reality and designing a new imaginary atmosphere (Park & Kim, 2022). Metaverse can rebuild famous places (e.g., Machu Picchu, Eiffel Tower) or familiar locations (e.g., home, public park) to provide real-world experience. Otherwise, the metaverse can reproduce hard-to-reach places (e.g., underwater, Himalayan mountains) to create a surrealistic experience. Metaverse emphasizes both human and non-human subjects in the process of object generation. As a target of interaction, object modules can generate an avatar of any desired personal trait. Object modules emphasize smooth multi-model interaction through realistic movement and expressions. The quality of virtual objects can express detailed texture to reproduce the realistic experience. In addition, surrealistic entities such as imaginary creatures and anthropomorphous objects can be reproduced in an augmented space.

Although it is relatively less studied, the sound synthesis evokes an immersive experience, similar to the visual function (Park & Kim, 2022). The sound synthesis provides a sense of presence and immersion in the augmented space. A voice should be an important means of reflecting one’s characteristics and persona. As an example of sound synthesis methods, Prosody records the variation of speech signals to capture and transfer statements (Fazel-Zarandi et al., 2019; Skerry-Ryan et al., 2018).

Global context encoding analyzes asymmetric background patterns between real-time objects of multiple motion captures (Mehta et al., 2020; Zellers et al., 2018). This indicates the attributes of object structures to translate the meaning of action more precisely when the behavioral input is processed. The global context encoding allows the system to record the real-time motions with a monochromatic camera and isolate the movement of an object.

Metaverse Contents

Metaverse contents deliver thoroughly arranged events and stories (e.g., realism and conceptual completeness), essential to offer an immersive experience in the virtual space (Park & Kim, 2022). Contents can be created by improving existing subjects or shifting paradigms. The environmental design consists of scene, color, audio, and location. Behavioral modeling includes motions, characteristics, and persona of user avatars. Convolutional neural networks (CNNs) or generative adversarial networks (GANs) can be used to manage panoramic visuals to produce virtual scenes and contents (Wang et al., 2020). To produce real-world experience, the augmented visuals need to avoid repetition and patterned meanings. The content structure should regulate the consistency and concentration of visual composition to maintain the cohesiveness of scenarios. Through an avatar, metaverse users can generate various multimedia resources such as images, videos, and texts, which represent users' beliefs and experiences (Park & Kim, 2022). Multimedia resources can be converted to various alignment types or integrated into a singular representation (Poria et al., 2017). This approach enhances the quality of multimedia theme by complementing information from the intra- and inter-modal data sources.

The multiple agents should represent distinct personas in the metaverse and communicate with various media simultaneously as if each user shows their own characteristics (Park & Kim, 2022). It is unlikely to provide enough immersive experience to users if any persona to interact has a monologue communication on every occasion. Metaverse requires a persona model that conveys more diverse multimodal interactions such as persona conversations, gestures, and facial expressions. For instance, spoken language understanding (SLU) can process a more precise meaning of persona than the cascaded conversion model (CCM) by preventing information loss during the transition of the voice signal to text.

While metaverse users generate a large amount of usage data, persona generation and entity augmentation are essential because substantial learning data is essential to prevent a resetting issue and the sparseness of several non-user personas (Park & Kim, 2022). Particularly, a generation of irregular user data such as experience and conversation history can be inclined to a restricted theme until sufficient data are organized. An entity is a distinctively associated object such as a renowned individual and location. The entity-based extension is a method to enhance personas of users by amplifying the quantity of entities. Amplifying the quantity of entities consists of reinforced learning, generative models, ontology, joint inference, and multiple intermodal entity extensions (Ren et al., 2017; Zeng et al., 2019). Co-learning with other data can be utilized to obtain distinct entities when limited labeled resources. The pre-trained model, based on the unbiased dataset, is a useful alternative to extract a larger number of entities. Creating non-playable characters in the metaverse requires unique approaches to deliver emotions and persona that manifest the worldview characteristics. Hence, a data population is needed to build a well-adjusted persona used in numerous settings.

In the metaverse, personas are essential to give users a sense of immersion by creating a unique personality for each character (Park & Kim, 2022). It is essential to create distinct characteristics with humanlike personas. When building a conversational model, however, mediating entities can be readjusted based on training data instead of persona for more precise responses. Since such monotony makes it hard to manage extended communications, the prior study suggested providing a more consistent pattern through the persona concept (Park & Kim, 2022). For instance, empathic dialogue systems take personas into consideration for managing longer user communications (Ma et al., 2020; Zheng et al., 2019). Personal dialog involves a substantial amount of multi-rotational datasets based on chronological GANs including diverse attributes of users (e.g., gender, age, location) (Lubis et al., 2019). In addition, researchers suggested a generation of textual storytelling emphasizing user persona (Chandu et al., 2019). The conditional language model creates numerous conversations (e.g., humor, horror, wiki) from prefixes without re-training data.

After classifying entities and characters by converting the various model data, it is essential to present the association of the contents and consider the relationship among entities (Park & Kim, 2022). In the metaverse, causality articulates the progress of various events, which is essential to understanding and relating those events to the story. In addition, entity linking is necessary to connect joint entities using the similarity distribution of subject entities. Structural learning methods (e.g., joint inference, link prediction, nonlinear relationship, classification) are used to connect various entities (Choubey & Huang, 2017; Moon et al., 2017). To be specific, the graph model indicates how different entities are connected together through the relationship dimensions of significant information. The conjunctive relationship can be advanced by clearly developing the inter-dependences among object cases of the scene graph, which enhances the process of joint inferences by setting a geometric layout and global context (Woo et al., 2018). More studies have emphasized the importance of convolution networks and graph models to improve the relations of topics (Kocaoglu et al., 2018; Xiao et al., 2020). Because the metaverse comprises diverse worldviews, merely allocating objects can be insufficient. Thus, it is necessary to develop and propose well-defined entity links. Information inference through given data is essential to improve metaverse content. Especially, factuality can be achieved through hierarchically and causally related objects. Previous researchers utilized various inference methods such as emotion, ontology, knowledge, variation inference, and modalities (Nam et al., 2017; Tambwekar et al., 2019).

In addition to event listings in the metaverse, it is crucial to clarify obscure relationships, causations, and scenarios between themes and events (Park & Kim, 2022). The metaverse is more complicated than the text-based scenario since it should be constructed well in embodied and multi-modal conditions. Each entity relationships need to be utilized to coordinate events, and they should be logically connected to structure lines of scenario. Scenario lines create the overall function and structure as an indicator of event relationships. Since it is not simply a listing of events, the relationship of entities in each event should connect with each other through long-standing dependencies. To organize a line of scenarios, it is essential to combine events comprised of entity relationships through a graph model. Events are classified as primary and secondary events based on their impact on the scenario development. Scenario construction involves an attention-based approach, hierarchical structure, and continuous sequence by highlighting significant topics (Baraldi et al., 2016; Isonuma et al., 2017). In a scene graph, user behavioral data can be collected throughout the duration of the avatar and advanced to the idea of lifelogging. The main contents of the scenario can be obtained by topic modeling and customized multi-modal data with reproductive language types. Yu and Riedl (2012) suggested a story organizer who customizes user stories with well-organized plot sequences. Bolanos et al. (2016) introduced the concept of visual lifelogging through the summary and retrieval of essential storytelling information. Li et al. (2019) described the generative model of story-image sequence that illustrates stories in sequence by presenting a sequence of images per sentence.

Scenarios can be established by combining entities and connecting the additional entities with a close relationship (Park & Kim, 2022). Scenario lines build a framework of entities and develop event connections to produce well-defined stories. Connections among events can be developed by entity relationships, associated with a scenario. There are various ways for entity extension such as attention, translational embedding, relationship inference, and multi-direction inference (Tang et al., 2019; Zhang et al., 2017). The text-video conversion method can be applied to the scene graph population procedure during multimodal integration. After combining sentence nodes and images with a top-down procedure, the conversion method controls and summarizes the event duration. The multimodal scenario graphs develop or break down events, represented as descriptive images with a multi-mode language.

To prevent discrepancies among events, it is essential for event-based expansion to validate whether the scenario should not undermine the concept (Park & Kim, 2022). Managing the scenario graph requires the event to be structured and connected without inconsistency. Scenario verification highlights a grammatical synthetic approach with direct verification of visual graphs through human-defined metrics (Bounegru et al., 2017; Novikova et al., 2017). The human-defined metrics can be classified into structural and search-based methods. The structural method assesses the overall structure and adjustment of the scenario and the search-based method observes particular facts regarding queries of users to verify whether the scenario is well-constructed without ambiguities.

Drawbacks of Metaverse

The metaverse possesses the potential to revolutionize numerous aspects of society, involving both work and personal life, as it emerges as the next prevailing paradigm in computing technology. However, despite the anticipated advantages, there exists a dearth of comprehensive exploration and analysis of the potential negative outcomes of the metaverse, with limited insights from academia and practitioners (Belk et al., 2022; Dwivedi et al., 2023). These negative perspectives involve a range of concerns, such as consumer vulnerabilities, privacy issues, a distortion of reality, challenges in human-computer interaction, technological abuse, misinformation, identity theft, intrusive promotion, financial scams, phishing, pornography, terrorism activities, social exclusion, mental health worries, sexual harassment, and unintended consequences stemming from the implementation of the metaverse (Dwivedi et al., 2021; Dwivedi et al., 2023; Gale et al., 2022; Tian et al., 2018; Usmani et al., 2022; Weingartner, 2021). It is of utmost importance to comprehend and acknowledge the potential downsides of the metaverse in order to effectively harness this innovation for the betterment of work, life, education, and social interactions. As the metaverse continues to evolve, the inherent challenges and risks it presents to individuals, organizations, and communities will inevitably transform. To mitigate the negative physical, psychological, and social impacts of the metaverse, it is crucial to implement applicable strategies at multiple levels (Dwivedi et al., 2023). These measures encompass the advancement of national technological and human capabilities, the establishment of specific legislation governing the metaverse, increased collaboration between industry and government, and international coordination. Such efforts are significant for effectively addressing the negative aspects and potential risks associated with the metaverse.

Metaverse in Tourism

Embarking on virtual journeys can offer users a transformative experience, allowing them to transcend their physical limitations. According to Gomes (2012), tourism activities within the virtual realm exhibit distinct characteristics such as tangibility (as opposed to intangibility), mobility (as opposed to immobility), and durability (as opposed to perishability). Furthermore, attractions in virtual tourism are closely tied to responsive services involving entertainment, recreation, transportation, and dining. This indicates that the shift towards the virtual realm involves many elements that form the essence of tourism itself. The current trend in tourism highlights a fresh approach that enables individuals to engage in travel experiences unhindered by physical constraints. While this does not imply the disappearance of traditional tourism, it suggests that virtual tourism can serve as a substitute for or complement to traditional forms of tourism.

The metaverse, as an advancement in hospitality and tourism, will revolutionize the way diverse travel experiences are segmented. According to Choi and Kim (2017), the metaverse platform can utilize information to provide users with novel, customized content within a virtual domain. Their focus centered on the metaverse system's overarching structure within the context of museum exhibitions. Similar to Google's Art Project, users can access virtual spaces that offer tourism-related content designed to stimulate their audiovisual senses. This platform has the potential to expand the experiential boundaries of visual content exhibitions by seamlessly integrating with existing online archives as a ubiquitous mode (Ogiela, 2015; Ogiela & Ogiela, 2014). Choi and Kim (2017) outlined the practical application of the metaverse platform by proposing a service structure. Experiential content can be delivered through the use of head-mounted devices (HMDs) and beacons, which act as technological mediators between the user's device and the content. This setup aims to broaden the user's experiential scope within the virtual space. They emphasized the importance of designing technologies that align with the objectives of the content, ensuring that innovative presentations and operations are utilized to deliver an immersive experience.

The metaverse is anticipated to revolutionize interactions among users, customers, and businesses in diverse ways. Lin and Chen (2017) proposed key design elements of the metaverse that aim to substitute reality by simulating user experiences, explorations, and interactions through audiovisual perceptions. Going beyond the boundaries of virtual reality, the metaverse platform encompasses three-dimensional stereoscopic data and seamlessly blends computer-generated representations with physical reality (Berryman, 2012). As a result, metaverse tourism should empower users to create distinctive narratives and offer differentiated experiential content.

The metaverse is set to become the new industry standard, offering infinite possibilities within virtual environments. Previous research has explored the application of the metaverse in various aspects of tourism (Buhalis & Karatay, 2022; Gursoy et al., 2022; Kim, 2021; Obeidy et al., 2017; Wei, 2022). For instance, Obeidy et al. (2017) investigated the variables associated with augmented reality technology for smart glass tourism from an extrinsic design perspective. Kim (2021) focused on utilizing the metaverse platform for cultural content management. Wei (2022) provided background reviews on blockchain-based tourism and the metaverse. Gursoy et al. (2022) summarized the business perspectives of metaverse tourism, consumer attitudes, and marketing trends. Buhalis and Karatay (2022) examined the role of mixed reality and the metaverse in shaping the virtual experiences and interactions of heritage tourism, particularly for younger generations. These studies have underscored the significance of socio-cultural and business aspects of consumer engagement in metaverse tourism. Building upon this existing literature, the present study aims to define the acceptance of metaverse tour platforms and discuss how technology can enhance and stimulate tourism experiences.

Technology Acceptance of Metaverse Tourism

The acceptance of new technologies by users is a crucial factor in determining their successful implementation (Aldhaban, 2012). The technology acceptance model (TAM), introduced by Davis (1986), has been a key theory used to investigate technology acceptance. However, it is essential to investigate external variables that are relevant to different research contexts in order to describe the diverse aspects of technologies. Ayeh et al. (2013) emphasized the significance of utilizing context-specific external variables in TAM research. For instance, studies focusing on the acceptance of internal IT within organizations have highlighted the role of external variables such as social influence. Similarly, studies exploring consumer acceptance of e-commerce have underscored the significance of playfulness as a crucial external variable (Obeidy et al., 2017). Therefore, it is essential to explore the specific external variables that are relevant to the context of metaverse tourism.

Davis (1986) initially developed the original format of TAM (TAM 1) with the aim of explaining the factors influencing user acceptance across various types of technologies and user demographics. TAM 1 focused on two key elements: perceived usefulness and perceived ease of use, as the primary predictors of user acceptance (Venkatesh & Davis, 1996). With multiple empirical tests consistently highlighting the significance of perceived usefulness in predicting behavioral intention, TAM 1 has emerged as a concise model for understanding user acceptance. The subsequent extension of TAM 1, known as TAM 2 (Venkatesh & Davis, 2000), expanded theoretical constructs of perceived usefulness. TAM 2 incorporated the antecedents encompassing social influence (e.g., subjective norm) and cognitive process (e.g., job relevance). Similarly, aiming to enhance the model by including theoretical constructs of the original TAM 1 and 2, Venkatesh and Bala (2008) introduced TAM 3. TAM 3 specifically incorporated constructs preceding perceived ease of use by expanding computer-related anchoring (e.g., computer self-efficacy) and adjustment perception (e.g., perceived enjoyment and novelty seeking). These developments in TAM have expanded the model's scope and enhanced its explanatory power by incorporating additional factors influencing user acceptance in different contexts (Rondan-Cataluña et al., 2015).

In an effort to develop a more complete model of technology acceptance, Venkatesh et al. (2003) conducted an empirical study that synthesized various components of behavioral intention models within the context of TAM. Through systematic analysis and comparative examination of previous models, they proposed the unified theory of acceptance and use of technology (UTAUT), which accounted for 70% of the variability in user intention. Subsequent studies have demonstrated the reliability and effectiveness of the UTAUT model in assessing technology acceptance (Chao, 2019). The UTAUT model involves several constructs, including effort and performance expectancy, social influence, facilitating conditions, behavioral intention, and usage behavior. Effort expectancy refers to the perceived ease of using the technology and serves as a crucial predictor of technology acceptance, accounting for complexity and ease of use. Performance expectancy, on the other hand, relates to the belief that technology will enhance task performance. Behavioral intention represents the extent to which users intend to consciously engage in behaviors related to the technology. Building upon the UTAUT model, Cimperman et al. (2016) further explored the roles of performance expectancy and effort expectancy, introducing the concepts of perceived usefulness and ease of use. For the current study, the acceptance theory variables (e.g., TAM and UTAUT) was adapted and modified to assess the acceptability of the metaverse within the tourism context.

Many studies have explored the application of the technology acceptance model (TAM) to augmented reality, virtual reality, metaverse, and the tourism industry. For example, Lin and Chen (2017) employed the uses and gratifications theory to investigate the acceptance of augmented reality technology in the context of tourism. Chao (2019) proposed a unified acceptance framework for virtual learning, focusing on user efficacy, usability, usefulness, and enjoyment. Zaman et al. (2022) examined the interplay between situational factors of technology acceptance and tourists' readiness for metaverse tourism. These studies provide valuable insights into the acceptance of emerging technologies within the tourism domain, shedding light on factors such as user motivations, usability, and situational readiness.

The current study explores key elements of technology acceptance within the context of metaverse tourism. These elements include perceived usefulness, job relevance, subjective norm, perceived ease of use, computer self-efficacy, perceived enjoyment, novelty seeking, expected satisfaction, situational motivation, and behavioral intention.

Perceived usefulness captures individuals' subjective perception of how engaging with the metaverse enhances travel quality, search efficiency, and accessibility. Job relevance represents the extent to which individuals perceive that metaverse tourism is relevant and applicable to their travel-related tasks. Subjective norm, often referred to as social norm, encompasses the perception of social pressures, expectations, and norms regarding the adoption or use of a particular technology (e.g., metaverse tourism), considering the beliefs and attitudes of significant others or reference groups.

Perceived ease-of-use reflects users' beliefs and perceptions regarding the simplicity and low effort required to use the metaverse tourism platform. Computer self-efficacy assesses participants' perceived proficiency in utilizing emerging technologies such as augmented reality and metaverse in the tourism domain. Perceived enjoyment investigates whether the new technology was perceived as enjoyable and pleasurable, independent of its practical outcomes. Novelty seeking, also known as innovativeness, reflects the degree to which individuals are open to trying new things, exploring novel experiences, and embracing technological advancements.

Expected satisfaction measures the affective response resulting from the positive cognitive gap between users' expectations and their actual experiences with metaverse technology in tourism. Situational motivation explores users' perception of situational factors that may hinder their travel activities. By examining these elements, the study aims to gain insights into the factors influencing technology acceptance and behavioral intention to use within the metaverse tourism context.

Perceived Usefulness

Perceived usefulness plays a vital role in the technology acceptance model, encompassing the extent to which a particular technology is believed to benefit its users. This perception subsequently influences users' intention to adopt new information technology (Davis, 1989; Davis et al., 1992). The concept gauges how users perceive the value of a technology, based on their beliefs about its ability to simplify their lives and enhance task performance. To illustrate, consider an electronic health monitoring device. A customer might question how this device would enhance their overall well-being. If the customer believes that the device will be advantageous to their well-being, their inclination to use it will be stronger. Perceived usefulness is frequently employed in computer science, information systems, and marketing to comprehend consumers' adoption behavior toward technology.

Many studies have underscored the crucial impact of perceived usefulness on the acceptance and intention to use novel technologies. For instance, research has revealed that users' perception of usefulness significantly influences their intention to utilize mobile and online library services (Xu et al., 2010; Yoon, 2016). Bolodeoku et al. (2022) highlighted the organizational role in effectively communicating the advantages of adopting new processes, leading to improved process adoption and employee performance. Additionally, Mois and Beer (2020) discovered a positive relationship between older consumers' intention to adopt robot assistance for aging in place and their perceived usefulness of the robot. Notably, exposure to the robot, such as seeing it in person, substantially increased their perception of its usefulness.

In the context of virtual tourism, Yang et al. (2022) investigated the influence of perceived usefulness and flow experience. Flow experience refers to a mental state where individuals become fully engrossed in an activity, losing track of time and focusing entirely on the task at hand (Csikszentmihalyi & Larson, 2014). In the realm of virtual tourism, the flow experience can alleviate users' technical discomfort and enhance their perception of the usefulness and acceptance of the technology. Acceptance of virtual tourism by users can positively impact their intention to visit the physical site. Lee (2022) examined the role of media richness in relation to perceived usefulness, enjoyment, satisfaction, and behavioral intentions (such as on-site visits and word-of-mouth recommendations). The media richness of destinations presented through virtual tourism enhanced users' perception of the technology's usefulness, subsequently increasing their satisfaction and behavioral intentions. El-Said and Aziz (2022) applied the concept of technology acceptance and the protective action decision model to investigate users' acceptance of virtual tourism during the pandemic period. Perceived usefulness of virtual tourism exerted a positive influence on user acceptance and strengthened the relationships between user acceptance and on-site visits.

The current study aims to expand the theoretical underpinnings of technology acceptance by investigating the role of perceived usefulness within the context of metaverse tourism. Perceived usefulness conceptualizes the belief that metaverse tourism will be useful to deliver a better tourism experience (Aburbeian et al., 2022; Chao, 2019; Davis, 1989; Lin & Chen, 2017; Rafique et al., 2018; Rafique et al., 2020). Specifically, perceived usefulness assesses individuals' subjective perception of how engaging with the metaverse enhances travel quality, search efficiency, and accessibility. It is expected that perceived usefulness of metaverse tourism will enhance expected satisfaction and behavioral intention to accept the technology. Additionally, job relevance and subjective norm are expected to influence perceived usefulness. Job relevance refers to the extent to which users perceive that metaverse tourism is applicable to their travel-related information search (Rondan-Cataluña et al., 2015; Venkatesh & Davis, 2000). Subjective norm, often referred to as social norm, reflects the perception of social factors, opinions, expectations, and norms regarding the usage of metaverse tourism technology, considering the attitudes of significant others and reference groups (Rondan-Cataluña et al., 2015;

Venkatesh & Davis, 2000). Investigating the role of these constructs will broaden the understanding of technology acceptance in the metaverse tourism context.

H1A: Job relevance will positively influence metaverse tourism users' perceived usefulness.

H1B: Subjective norm will positively influence metaverse tourism users' perceived usefulness.

Computer Self-efficacy

The social cognitive theory defines self-efficacy as a user's perceived capability to execute a certain job proficiently (Bandura, 1986). Self-efficacy is related to one's ability to attain specific performance (i.e., goal achievement) and represents one's confidence, amount of energy, motivation, and self-control behavior. Self-efficacy is a cognitive domain of human experience, together with one's self-evaluation and devotion to attain a particular level of goal achievement (e.g., self-management of chronic disease, smoking, eating, alcohol use, exercise). Self-efficacy has been widely applied to the field of education, psychology, consultation, and clinical practice (Bandura, 1986).

Computer self-efficacy goes beyond mere technical skill and encompasses users' ability to effectively utilize computer-related tasks. In essence, it refers to the extent to which users believe in their abilities to successfully initiate and complete computer-related tasks (Ozturk et al., 2016). Previous studies have applied the concept of computer self-efficacy to examine users' perceived proficiency in emerging technologies. For instance, Nikou and Economides (2017) defined computer self-efficacy as users' perception of their ability to utilize mobile technologies to accomplish specific tasks. Computer self-efficacy in learning serves as a driving factor in assessing technology usage and can significantly impact users' perceived ease of use and technology adoption. Additionally, Chao (2019) defined computer self-efficacy as users' perception of their ability to navigate and accomplish tasks related to a particular technology. They also suggested that computer self-efficacy can serve as a significant indicator of users' perceived enjoyment.

In the context of virtual tourism, Pilut et al. (2022) conducted a study comparing two groups of participants: one group engaged in computer-based virtual reality tours, while the other group participated in voice-over PowerPoint grocery store tours. The study focused on the participants' self-efficacy in terms of adopting and maintaining a healthy diet. Through the use of an avatar and pre-recorded audio segments, participants underwent simulated experimental conditions over several weeks. The findings revealed that the virtual reality approach had a positive impact on participants' knowledge and ability to make informed food choices. Asimah et al. (2022) proposed the moderating role of technology self-efficacy in the context of virtual leisure and recreational experiences. Technology self-efficacy refers to an individual's confidence in their ability to execute technologically advanced tasks. The researchers found that technology self-efficacy enhanced participants' perception of the experiential quality of virtual leisure experiences and contributed to their psychological well-being. In the study by Itani and Hollebeek (2021), self-efficacy was defined as consumers' assessment of their ability to cope with and overcome the threats posed by COVID-19. The researchers discovered a positive association between self-efficacy and consumers' intention to maintain social distancing from others. This, in turn, strengthened their inclination to opt for virtual reality tourism experiences instead of in-person visits.

The primary objective of the current study is to broaden the theoretical foundations of technology acceptance by examining the significance of computer self-efficacy within the context of metaverse tourism. In this study, computer self-efficacy assesses users' confidence and proficiency in utilizing the metaverse independently, without relying heavily on individual assistance or instructions (Aburbeian et al., 2022; Alvarez-Risco et al., 2022;

Bandura, 1986; Chao, 2019; Rondan-Cataluña et al., 2015; Venkatesh & Bala, 2008). It is anticipated that computer self-efficacy will positively influence users' perceived ease of use toward engaging in metaverse tourism.

Perceived Enjoyment

Perceived enjoyment is the subjective evaluation of the enjoyable experience and the degree to which people find a certain product and technology to be enjoyable (Davis et al., 1992). It is often used in fields such as marketing, promotions, and information science to understand consumer preferences. In the technology acceptance model, perceived enjoyment evaluates whether a technology is perceived to be fun on its own, apart from consequential outcomes resulting from the technology (Park et al., 2012). It can be affected by various factors such as previous experience, personal interests, expectations, and the physical and social context where the experience takes place (Davis et al., 1992; Park et al., 2012).

The impact of perceived enjoyment on technology usage has been extensively demonstrated, making it the most commonly studied external variable in technology acceptance (Sánchez-Prieto et al., 2016; Zhang et al., 2017). Perceived enjoyment plays a crucial role as it significantly influences perceived usefulness, ease of use, behavioral intentions (Lin & Chen, 2017), and user satisfaction (Maillet et al., 2015; Rouibah et al., 2021; Shiau & Luo, 2013) within the context of technology acceptance. When a tourism platform delivers internal pleasure or enjoyment to users, they perceive it as effortless and enjoyable, resulting in positive outcomes such as satisfaction and behavioral intention (So et al., 2021; Sung & Yun, 2010).

In the context of virtual tourism, Lee (2022) conducted a study examining the connection between media richness and perceived enjoyment, and their subsequent impact on satisfaction. The findings revealed that media richness had a positive and significant influence on perceived enjoyment, and perceived enjoyment, in turn, had a positive and significant effect on satisfaction. The hedonic value associated with perceived enjoyment, such as the level of interest experienced, played a crucial role in persuading tourists to visit the destination. El-Said and Aziz (2022) identified a positive influence of perceived enjoyment on intention, as well as a significant relationship between perceived ease of use and enjoyment. Perceived enjoyment served as a mediator between perceived ease of use, intention, and actual visitation. These findings suggest that the enjoyment derived from virtual reality experiences can serve as a significant indicator of users' attitudes, technology acceptance, and intentions to visit the actual destination. When users perceive their virtual experience as enjoyable, their desire to utilize similar technology and their intention to travel to the destination are likely to increase.

This study expects the significant role of perceived enjoyment on perceived ease of use. Perceived enjoyment conceptualizes various affective responses, including entertainment, pleasantness, enjoyment, stimulation, positiveness, and a sense of adventure and exploration, arising from the use of metaverse tourism technology (Chao, 2019; Lin & Chen, 2017; Rondan-Cataluña et al., 2015). By examining the influence of perceived enjoyment, this study aims to expand the applicability of the technology acceptance model in the metaverse tourism context.

Perceived Ease of Use

Perceived ease of use refers to the level of effort required to effectively utilize a particular technology (Davis, 1989; Davis et al., 1992). It represents an individual's subjective assessment of how easy it is to use technology and measures the perceived user-friendliness of the technology. This concept serves as an important indicator of users' likelihood to accept and continue using the technology. When a new technology requires less effort to learn and use, users are more likely to experience improved task performance and exhibit a positive intention to adopt the technology. Even if the technology may not be technically simpler than other alternatives, users are more inclined to use it when they perceive it to be easy to use. For example, in the case of an electronic device that monitors an individual's health condition, a customer may question whether the device is easy to learn how to use. If the customer perceives that the device will be easy to learn and operate effectively, their intention to use the device will be stronger. Several factors can influence perceived ease of use, including the clarity of instructions, the consistency of the technology, the design of the user interface, and the user's prior experience with related technologies.

Previous research has established a significant correlation between perceived ease of use and users' behavioral intention. For instance, in the domain of mobile learning, perceived ease of use has been found to be strongly associated with perceived usefulness and intention to use (Sheikhshoaei & Oloumi, 2011; Yoon, 2016). Furthermore, Maillet et al. (2015) identified perceived ease of use as a crucial determinant of user satisfaction. Jarvenpaa and Staples (2000) emphasized the importance of user-friendliness in facilitating knowledge sharing by reducing the cognitive load on users. In the context of older consumers' acceptance of robot assistance for aging in place, Mois and Beer (2020) discovered a significant relationship between perceived ease of use and intention to accept the robot. Moreover, the level of exposure to the robot, such as seeing it in person, was found to enhance perceived ease of use. These studies collectively demonstrate that perceived ease of use plays a vital role in shaping users' behavioral intentions, satisfaction, knowledge sharing, and acceptance of technology across various domains.

Within the context of virtual tourism, Yang et al. (2022) have highlighted the substantial impact of technology optimism on perceived ease of use. Furthermore, they identified perceived ease of use as a mediator in the relationship between technology optimism and perceived usefulness. Perceived ease of use plays a crucial role in alleviating various constraints, such as time, cost, and learning barriers, associated with engaging in virtual tourism technology. Consequently, it directly enhances users' intention to adopt the technology. El-Said and Aziz (2022) emphasized the importance of several factors, including language support and ease of navigation, in assessing the perceived ease of use of virtual tourism. They found that perceived ease of use had a significant influence on perceived usefulness and enjoyment. Additionally, the relationship between perceived ease of use and users' acceptance intention was mediated by perceived usefulness and enjoyment. These findings underscore the significance of perceived ease of use in the virtual tourism domain. It not only helps to overcome barriers and improve adoption intentions but also acts as a catalyst for perceived usefulness and enjoyment, ultimately influencing users' acceptance of virtual tourism technology.

The objective of this study is to broaden the understanding of technology acceptance by introducing the concept of perceived ease of use in the metaverse tourism context. Perceived ease of use conceptualizes users’ perception that metaverse tourism requires less effort to execute and puts less physical and mental burden while using the system (Akour et al., 2022; Chao, 2019; Davis, 1989; Lin & Chen, 2017; Rafique et al., 2018; Rafique et al., 2020; Zheng, 2020). It is expected that perceived ease of use positively influences perceived usefulness, expected satisfaction, and behavioral intention to accept the metaverse tourism technology. Additionally, computer self-efficacy, perceived enjoyment, and novelty seeking are expected to influence perceived ease of use. Computer self-efficacy assesses users’ confidence and proficiency in technology in using metaverse tourism regardless of the individual assistance and instructions (Aburbeian et al., 2022; Alvarez-Risco et al., 2022; Bandura, 1986; Chao, 2019; Rondan-Cataluña et al., 2015; Venkatesh & Bala, 2008). Novelty seeking, also known as innovativeness, pertains to an individual's tendency to adopt new technologies and reflects the degree to which individuals are open to trying new things, exploring novel experiences, and embracing technological advancements (Borhan et al., 2019; Kim et al., 2017; Kim et al., 2020). By investigating the role of these constructs, this study expects to broaden the applicability of technology acceptance in the metaverse tourism context.

H2A: Computer self-efficacy will positively influence metaverse tourism users’ perceived ease of use.

H2B: Perceived enjoyment will positively influence metaverse tourism users’ perceived ease of use.

H2C: Novelty seeking will positively influence metaverse tourism users’ perceived ease of use.

H3A: Perceived ease of use will positively influence metaverse tourism users’ perceived usefulness.

Expected Satisfaction

Satisfaction is a feeling of contentment, pleasure, and fulfillment that comes from achieving one’s desired outcomes and needs. In consumer psychology, satisfaction results from the emotional response to the cognitive discrepancy between the users’ expectation and their experience (i.e., the expectation should meet at least or exceed) (Mondi et al., 2008). It is an essential aspect of customer experience and is often used as a measure of a successful marketing procedure. In addition to being an important factor in customer experience, consumer satisfaction also has a significant impact on customer loyalty and repeat purchases (e.g., Choi & Chu, 2001; Ji & Prentice, 2021; Shankar et al., 2003). When consumers are satisfied with a product or service, they are more likely to continue using it and recommend it to others, which can lead to increased sales and revenue for the company.

Satisfaction is a crucial affective response that holds great importance in the acceptance of technology by users (Wixom & Todd, 2005). It serves as a vital outcome of technology acceptance and is influenced by perceptions of usefulness, ease of use, and enjoyment (Davis, 1989; Davis et al., 1992; Rouibah et al., 2021). The satisfaction users experience with technology plays a significant role in its success in the market, impacting factors such as revenue and sales, as it influences users' intention to continue using the technology and recommend it to others. When people find themselves satisfied with the duration and format of the content provided by technology, they are more likely to persist in using it (Rosengren, 1974). Additionally, DeLone and McLean (2016) identified user satisfaction as a crucial indicator of successful information transfer within a specific system, ultimately enhancing positive behavioral intention.

Satisfaction serves as a key metric in technology acceptance, reflecting users' perceptions of usefulness, ease of use, and enjoyment. It plays a pivotal role in the market success of technology by influencing user behavior, recommendations, and information transfer within the system. In this study, satisfaction conceptualizes the belief that metaverse tourism will provide advantages, values, efficiencies, benefits, and favorable experiences (Akour et al., 2022; Chao, 2019; Lin & Chen, 2017; Zheng, 2020). It is expected that the cognitive evaluations of the technology (e.g., perceived usefulness and ease of use) will positively influence expected satisfaction. Additionally, expected satisfaction is proposed to influence behavioral intention to accept metaverse tourism technology. Examining the influence of perceived usefulness, ease of use, and expected satisfaction will broaden the understanding of technology acceptance in the metaverse tourism context.

H3B: Perceived ease of use will positively influence metaverse tourism users' expected satisfaction.

H4A: Perceived usefulness will positively influence metaverse tourism users' expected satisfaction.

Behavioral Intention

Behavioral intention, within the framework of the technology acceptance model, refers to a user's intention to use a particular technology (Davis, 1989; Davis et al., 1992). It represents the user's inclination and readiness to actually engage with the technology. As a critical factor in determining user behavior, behavioral intention serves as a key measure of a technology's success in the market. Insights derived from understanding behavioral intention can inform the design and development of new technologies and enhance the adoption and usage of existing ones.

According to the expectation confirmation theory, a user's intention to use a specific technology is influenced by their previous satisfaction with the user experience (Shin, 2011). System acceptance, which reflects a user's propensity to utilize a particular technology, is a primary predictor of behavioral intention (Davis et al., 1989; Szajna, 1996). Previous research in the field of technology acceptance has predominantly constructed the concept of behavioral intention based on users' intentions to use, which serves as a theoretical precursor to actual behavior (Mathieson et al., 2001; Szajna, 1996). These studies have provided valuable insights into the key factors driving technology acceptance and usage.

Behavioral intention plays a vital role in technology acceptance, representing users' intention to use a specific technology. It serves as an indicator of the technology's success in the market and provides valuable information for the design, development, and promotion of technologies to improve their adoption and usage. Behavioral intention to use metaverse tourism conceptualizes user's interest, assumption, and prediction to utilize the technology when it is available for tourism services (Alvarez-Risco et al., 2022; Chao, 2019; Davis, 1989; Lin & Chen, 2017; Rafique et al., 2020). In the present study, behavioral intention to use metaverse tourism is the primary dependent construct. It is expected that perceived usefulness, ease of use, and expected satisfaction will positively influence behavioral intention to use metaverse tourism.

> H3C: Perceived ease of use will positively influence users' behavioral intention to use metaverse tourism.

> H4B: Perceived usefulness will positively influence users' behavioral intention to use metaverse tourism.

> H5: Expected satisfaction will positively influence users' behavioral intention to use metaverse tourism.

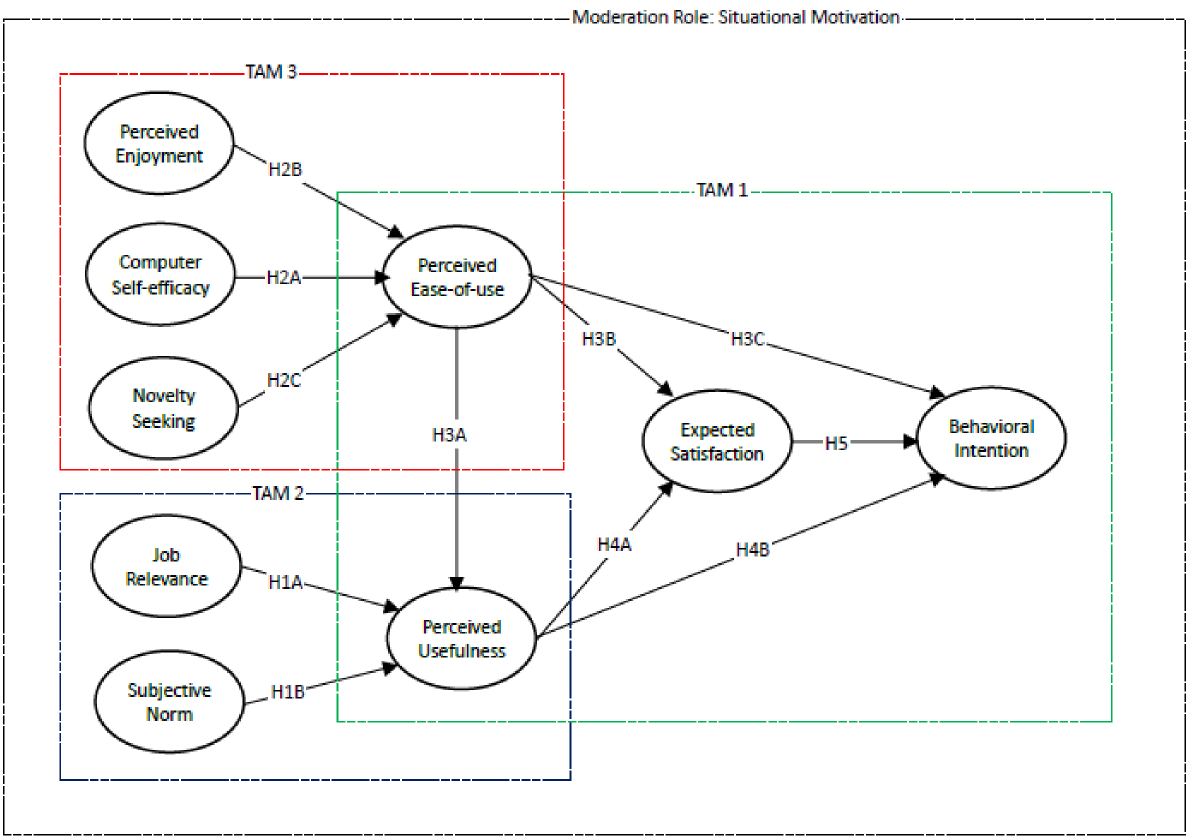
Situational Motivation

The situational theory of problem-solving (STOPS) implies three fundamental elements such as recognition of problems, constraints, and involvements to explain a user's information processing behaviors (Aldoory & Sha, 2007). STOPS theory indicates that users recognize problems by detecting objective that needs to be completed and is closely related to their communicative intentions to improve the situation (Kim et al., 2010). Situational motivation refers to whether individuals are willing to stop and think about the current situation, find what to do to help with this situation, and show curiosity about the situation (Grunig, 1997). Tourists' interest in using metaverse and virtual realm tourism would be higher when the destination is not directly available for travel due to external situations (e.g., restrictions, personal reasons) (Marr, 2021; Schaal, 2021).

The presence of situational motivators represents users' personalized demand, which can be useful indicators to design metaverse tourism features. In this study, situational motivation is operationalized by users' perception of the situation that might prevent their travel (Aldoory & Sha, 2007; Grunig, 1997; Kim et al., 2010; Zheng, 2016). It is expected that situational motivation will influence the strength of the relationship between computer self-efficacy, perceived enjoyment, novelty seeking, perceived ease of use, job relevance, subjective norm, perceived usefulness, expected satisfaction, and behavioral intention to use metaverse tourism. Investigating the moderating role of situational motivation will broaden the applicability of technology acceptance in metaverse tourism. The conceptual framework of this study is shown in Figure 1.

Figure 1

Conceptual Framework



CHAPTER 3

METHODOLOGY

The survey items utilized in this study were derived from the existing technology acceptance literature (e.g., Rondan-Cataluña et al., 2015; Venkatesh & Bala, 2008; Venkatesh & Davis, 1996; Venkatesh & Davis, 2000; Venkatesh et al., 2003). These items were subsequently modified to suit the specific context of metaverse tourism. Technology self-efficacy is constructed to measure confidence using the metaverse tour platform (Aburbeian et al., 2022; Alvarez-Risco et al., 2022; Bandura, 1986; Chao, 2019). Perceived usefulness measures how the metaverse tour platform is perceived to enhance accessibility, convenience, and quality of travel (Aburbeian et al., 2022; Chao, 2019; Davis, 1989; Lin & Chen, 2017; Rafique et al., 2018; Rafique et al., 2020). Perceived ease-of-use measures whether users perceive the execution of the metaverse tour platform to be easy and understandable (Akour et al., 2022; Chao, 2019; Davis, 1989; Lin & Chen, 2017; Rafique et al., 2018; Rafique et al., 2020; Zheng, 2020). Perceived enjoyment measures whether users perceive the metaverse tour platform as enjoyable, fun, and pleasant (Chao, 2019; Lin & Chen, 2017). Satisfaction measures how users are satisfied with the overall experience of the metaverse platform (Akour et al., 2022; Chao, 2019; Lin & Chen, 2017; Zheng, 2020). Situational Motivation refers to the users' perception of the situation that might prevent their travel (Aldoory & Sha, 2007; Grunig, 1997; Kim et al., 2010; Zheng, 2016). Behavioral intention measures whether users intend to use the metaverse platform in the future (Alvarez-Risco et al., 2022; Chao, 2019; Davis, 1989; Lin & Chen, 2017; Rafique et al., 2020). All items are measured on a 7-point Likert scale (i.e., continuous data).

Research Design

This study follows the sequence of data collection, a summary of demographics (i.e., frequency), reliability test (i.e., internal consistency, exploratory factor analysis, convergent validity), confirmatory factor analysis (i.e., convergent and discriminant validity), and structural equation modeling. The socio-demographic properties are investigated to find the overall characteristics of the sample and check whether the sample is representative of the target population. The internal consistency reliability is examined to investigate whether each item within the construct is significantly related and represented. The exploratory factor analysis is checked to identify the factor structure and convergent validity. The confirmatory factor analysis is investigated to check convergent and discriminant validity (i.e., factor loadings, average variance extracted, composite reliability) and examine whether the model fit is appropriate. The structural equation modeling shows the regression weights and direct and indirect effects to test hypotheses. A generalized discussion of the analysis follows.

Research Plan

This study utilizes an online survey and targets sample populations who have traveled regularly and used AR-related technology. To identify the consistency and structure of the instruments, a pilot study using 40 data is addressed. Considering the number of constructs, this study collects at least 300 samples, estimating more than 200 usable data. The online survey includes the survey measurement items and the socio-demographic questions. The survey questionnaire is created by UNT Qualtrics and distributed to the randomized participant pool through the online survey platform. The submission to the Institutional Review Board (IRB) is completed based on the above information.

Pilot Study: Data Collection

A pilot study was conducted to examine the feasibility of measurement items of metaverse technology acceptance. The items are measured based on a literature review on user acceptance of new technology and revised in the context of a metaverse in tourism. Particularly, the main purpose of the pilot study is to investigate the frequency of each item, response rate, scale reliability, and construct validity. The pilot study includes items for screening, general technology literacy, self-efficacy for metaverse tourism, perceived usefulness, perceived ease-of-use, perceived enjoyment, expected satisfaction, situational motivation for metaverse tourism, and behavioral intention for metaverse tourism. Table 2 summarizes the overview of measurement items. Questions regarding the demographic profile of participants (e.g., gender, age, residency, education, marriage) are asked thereafter. At the end of the survey, optional open-ended responses and suggestions for the survey are requested.

A convenience sampling was applied that involves selecting participants who are readily accessible for the study (e.g., college students). The majority of participants are college students at a university in the North Texas region. By providing extra credits in class, students are asked to participate in the survey (i.e., Online) throughout the period of November 28, 2022, to December 16, 2022. A total of 40 participants responded. 32 out of 40 data are complete and usable for data analysis. The summary of the demographic profile is presented in Table 3. There are more females (62.5%) than males (34.4%). Participants' age range is predominantly between 20 and 29 (75%). Participants' residency is predominantly in North/Central America (78.1%) and Asia (15.6%).

Table 2

Pilot Study Instrument Summary

Construct	Items	Label	Corrected Item-Total Correlation	Cronbach Alpha	References
Computer Self-efficacy	I will be confident of using the metaverse tour platform even if there is no one around to show me how to do it.	Q5_1	.865	.928	Aburbeian et al. (2022); Alvarez-Risco et al. (2022); Bandura (1986); Chao (2019)
	I will be confident of using the metaverse tour platform even if I have never used such a system before.	Q5_2	.863		
	I will be confident of using the metaverse tour platform by reading the instructions for reference.	Q5_3	.714		
	Using the metaverse tour platform is a task I can perform.	Q5_4	.742		
	I have the necessary technological skills to use the metaverse tour platform.	Q5_5	.829		
	I have sufficient technological skills to use the metaverse tour platform.	Q5_6	.832		
Perceived Usefulness	Using the metaverse tour platform will enable me to access the tourism destination more quickly.	Q13_1	.752	.852	Aburbeian et al. (2022); Chao (2019); Davis (1989); Lin and Chen (2017); Rafique et al. (2018); Rafique et al. (2020)
	The metaverse tour platform will be useful for seeking information related to the tourism destination.	Q13_2	.826		
	Using the metaverse tour platform will enable my travel to the destination more easily.	Q13_3	.789		
	Using the metaverse tour platform will improve the quality of my travel experience.	Q13_4	.452		
	The metaverse tour platform will enhance my effectiveness in seeking information related to the tourism destination.	Q13_5	.718		
	Using the metaverse tour platform will give me greater control over my travel schedule.	Q13_6	.649		

(table continues)

Construct	Items	Label	Corrected Item-Total Correlation	Cronbach Alpha	References
	With the metaverse tour platform, I can go to places where I cannot visit in real life.	Q13_7	.363		
Perceived Ease of Use	Learning to use the metaverse tour platform will be easy for me.	Q14_1	.758	.942	Akour et al. (2022); Chao (2019); Davis (1989); Lin and Chen (2017); Rafique et al. (2018); Rafique et al. (2020); Zheng (2020)
	I will find it easy to get the metaverse tour platform to do what I want to do.	Q14_2	.727		
	My interaction with the metaverse tour platform will be clear and understandable.	Q14_3	.709		
	I will find the metaverse tour platform to be flexible to interact with.	Q14_4	.723		
	It will be easy to become skillful at using the metaverse tour platform.	Q14_5	.858		
	Learning the metaverse tour platform will be effortless.	Q14_6	.755		
	The procedure of using the metaverse tour platform will be easy to learn.	Q14_7	.825		
	The process of using the metaverse tour platform will be easy to operate.	Q14_8	.859		
	It will be easy to remember how to use the metaverse tour platform.	Q14_9	.823		
Perceived Enjoyment	I will find using the metaverse tour platform enjoyable.	Q15_1	.935	.970	Chao (2019); Lin and Chen (2017)
	The actual process of using the metaverse tour platform will be pleasant.	Q15_2	.931		
	I will have fun using the metaverse tour platform.	Q15_3	.947		
Expected Satisfaction	I believe that the metaverse tour platform will have many advantages.	Q16_1	.915	.965	Akour et al. (2022); Chao (2019); Lin and Chen (2017); Zheng (2020)
	I believe that the metaverse platform will have a great value in tourism setting.	Q16_2	.919		

(table continues)

Construct	Items	Label	Corrected Item-Total Correlation	Cronbach Alpha	References
	I believe the efficiency of metaverse tour platform will be satisfactory.	Q16_3	.773		
	I believe the experience of metaverse tour platform will be satisfactory.	Q16_4	.938		
	Generally, I am in favor of using the metaverse tour platform.	Q16_5	.883		
	I think using the metaverse tour platform will be beneficial.	Q16_6	.924		
Situational Motivation	I often stop and think about the situation that might prevent my travel.	Q17_1	.923	.958	Aldoory and Sha (2007); Grunig (1997); Kim et al. (2010); Zheng (2016)
	I often stop and think about what I can do to help with the situation that might prevent my travel.	Q17_2	.887		
	I have curiosity about the situation that might prevent my travel.	Q17_3	.920		
Behavioral Intention	I plan to use the metaverse tour platform in the future.	Q18_1	.898	.964	Alvarez-Risco et al. (2022); Chao (2019); Davis (1989); Lin and Chen (2017); Rafique et al. (2020)
	Assuming I have access to the metaverse tour platform, I intend to use it.	Q18_2	.958		
	Assuming I have access to the metaverse tour platform, I predict that I will use it.	Q18_3	.929		
	I am interested in using the metaverse tour platform.	Q18_4	.864		

The highest degree of education participants completed is either high school (50.0%) or a bachelor's degree (43.8%). Most participants are single (87.5%).

Table 3

Pilot Study Demographic Profile

Items		Frequency	%
Gender	Male	11	34.4
	Female	20	62.5
	Prefer not to say	1	3.1
Age	Below 20	2	6.3
	20-29	24	75.0
	30-39	3	9.4
	40-49	3	9.4
	50-59	0	0.0
	60-69	0	0.0
	Above 70	0	0.0
	Prefer not to say	0	0.0
Hometown Location	North/Central America	25	78.1
	South America	1	3.1
	Europe	0	0.0
	Africa	0	0.0
	Asia	5	15.6
	Caribbean Islands	0	0.0
	Pacific Islands	0	0.0
	Other	1	3.1
	Prefer not to say	0	0.0
Education	High School	16	50.0
	Bachelor's Degree	14	43.8
	Master's Degree	2	6.3
	Doctoral Degree	0	0.0
	Prefer not to say	0	0.0
Marriage	Yes	4	12.5
	No	28	87.5
	Prefer not to say	0	0.0

There are two open-ended responses to the suggestions of the pilot study. One suggested allowing participants to write examples of metaverse apps they have ever used (e.g., iFIT). Another suggested questions to be more specific to the context of travel and metaverse. These suggestions are represented in the forthcoming study.

The pilot study includes screening questions to investigate the overall familiarity with the concept of virtual and augmented reality and metaverse. The summary of responses is presented in Table 4. Most participants heard of virtual and augmented reality (90.6%) and metaverse (84.4%). The majority of participants have ever used technologies related to virtual and augmented reality (75%), while significantly fewer participants have ever used technologies related to metaverse (50%).

Table 4

Pilot Study Screening Questions

Items	Yes	No
Prior to the survey, I have heard of virtual and augmented reality.	29	3
Prior to this survey, I have used technologies related to virtual and augmented reality.	24	8
Prior to this survey, I have heard of metaverse.	27	5
Prior to this survey, I have used technologies related to metaverse.	16	16

Table 5

Pilot Study General Technology Literacy

Items	SD	D	SWD	N	SWA	A	SA
I consider myself an intermediate-advanced user of Microsoft Windows or Mac OS.	1	0	2	2	6	11	10
I consider myself an intermediate-advanced user of social networks (e.g., Facebook, Instagram).	0	1	0	1	6	12	12
I consider myself an intermediate-advanced user of video games.	6	6	3	2	4	1	10

Source: Alvarez-Risco et al. (2022). SD = strongly disagree; D = disagree; SWD = somewhat disagree; N = neutral; SWA = somwhat agree; A = agree; SA = strongly agree.

The pilot study examines the responses for general technology literacy (Table 5). A majority of participants are at least moderately advanced users of Windows and Mac OS

(84.5%) and social media (e.g., Facebook, and Instagram) (93.8%). The literacy of video gaming, however, is evenly distributed, either less advanced (47%) or more advanced (46.9%).

Pilot Study: Data Analysis

This study investigated the reliability and validity of the factors measured with multiple items constructed based on the literature on metaverse and technology acceptance. The reliability test was applied to examine how much internal consistency is shown between the measurement items. This study calculated Cronbach's alpha coefficient to examine the consistency of measurement. Cronbach's alpha of 0.6 or above is used as the acceptable value for newly developed items or those containing them (Nunnally, 1978). In order to test the reliability of instruments, the correlation between the measurement item and other items excluding the item (i.e., corrected item-total correlation, CITC) was analyzed. If the CITC is 0.4 or higher, the item can be identified as internally consistent with the concept. Table 2 summarized the results of the reliability test. All the factors showed acceptable Cronbach's alpha coefficient, which demonstrates the consistency of measurement. Perceived usefulness has an item (Q13_7) with lower CITC that requires further attention and modification in the forthcoming study.

In the pilot study, an exploratory factor analysis (EFA) was conducted for the test of validity using the principal component extraction method and varimax rotation, which represent the factor structure assuming non-intercorrelation between each construct. This study extracted a fixed number of factors with an Eigenvalue of 0.938, which moderately satisfied the general standard (i.e., Eigenvalue of 1). Factor loading of 0.3 and explained total cumulative variance of 0.4 was placed as criteria for factor evaluation (Bagozzi & Yi, 1988). The measurement of this study includes items that are empirically verified in previous studies but also newly developed. Thus, this pilot study inputs all items measuring multidimensional constructs to execute an exploratory analysis to figure out the factor structure. Table 6 summarizes the results of the exploratory factor analysis. Bartlett's test of sphericity showed an appropriate result ($P<0.001$). The Kaiser-Meyer-Olkin (KMO) measure of sampling accuracy didn't show the appropriate result (i.e., less than .6) due to the low sample size. The items from behavioral intention, self-efficacy, perceived ease of use, and situational motivation showed decent factor loading, which suggests the validity of the measurement. However, the items from expected satisfaction, perceived usefulness, and perceived enjoyment needed further attention and modification in the forthcoming study. The factor loadings of items (labeled 13_3, 13_4, 13_5, 13_6, 16_5) were lower than 0.3 and there was potential collinearity between behavioral intention, expected satisfaction, perceived usefulness, and perceived enjoyment.

Table 6

Pilot Study Exploratory Factor Analysis

Factor	Item	Label	Factor Loading	Cum Exp Var
Computer Self-efficacy	I will be confident of using the metaverse tour platform even if there is no one around to show me how to do it.	Q5_1	.894	.608
	I will be confident of using the metaverse tour platform even if I have never used such a system before.	Q5_2	.911	
	I will be confident of using the metaverse tour platform by reading the instructions for reference.	Q5_3	.658	
	Using the metaverse tour platform is a task I can perform.	Q5_4	.684	
	I have the necessary technological skills to use the metaverse tour platform.	Q5_5	.866	
	I have sufficient technological skills to use the metaverse tour platform.	Q5_6	.846	

(table continues)

Factor	Item	Label	Factor Loading	Cum Exp Var
Perceived Usefulness	Using the metaverse tour platform will enable me to access the tourism destination more quickly.	Q13_1	.336	.832
	The metaverse tour platform will be useful for seeking information related to the tourism destination.	Q13_2	.354	
	Using the metaverse tour platform will enable my travel to the destination more easily.	Q13_3	.189	
	Using the metaverse tour platform will improve the quality of my travel experience.	Q13_4	.129	
	The metaverse tour platform will enhance my effectiveness in seeking information related to the tourism destination.	Q13_5	.167	
	Using the metaverse tour platform will give me greater control over my travel schedule.	Q13_6	.170	
	With the metaverse tour platform, I can go to places where I cannot visit in real life.	Q13_7	.765	
Perceived Ease of Use	Learning to use the metaverse tour platform will be easy for me.	Q14_1	.501	.694
	I will find it easy to get the metaverse tour platform to do what I want to do.	Q14_2	.371	
	My interaction with the metaverse tour platform will be clear and understandable.	Q14_3	.312	
	I will find the metaverse tour platform to be flexible to interact with.	Q14_4	.539	
	It will be easy to become skillful at using the metaverse tour platform.	Q14_5	.852	
	Learning the metaverse tour platform will be effortless.	Q14_6	.664	
	The procedure of using the metaverse tour platform will be easy to learn.	Q14_7	.874	
	The process of using the metaverse tour platform will be easy to operate.	Q14_8	.803	
	It will be easy to remember how to use the metaverse tour platform.	Q14_9	.539	
Perceived Enjoyment	I will find using the metaverse tour platform enjoyable.	Q15_1	.475	.857
	The actual process of using the metaverse tour platform will be pleasant.	Q15_2	.559	
	I will have fun using the metaverse tour platform.	Q15_3	.473	
Expected Satisfaction	I believe that the metaverse tour platform will have many advantages.	Q16_1	.343	.799
	I believe that the metaverse platform will have a great value in tourism setting.	Q16_2	.309	
	I believe the efficiency of metaverse tour platform will be satisfactory.	Q16_3	.516	

(table continues)

Factor	Item	Label	Factor Loading	Cum Exp Var
	I believe the experience of metaverse tour platform will be satisfactory.	Q16_4	.412	
	Generally, I am in favor of using the metaverse tour platform.	Q16_5	.172	
	I think using the metaverse tour platform will be beneficial.	Q16_6	.363	
Situational Motivation	I often stop and think about the situation that might prevent my travel.	Q17_1	.954	.750
	I often stop and think about what I can do to help with the situation that might prevent my travel.	Q17_2	.895	
	I have curiosity about the situation that might prevent my travel.	Q17_3	.958	
Behavioral Intention	I plan to use the metaverse tour platform in the future.	Q18_1	.890	.451
	Assuming I have access to the metaverse tour platform, I intend to use it.	Q18_2	.912	
	Assuming I have access to the metaverse tour platform, I predict that I will use it.	Q18_3	.893	
	I am interested in using the metaverse tour platform.	Q18_4	.915	

Kaiser-Meyer-Olkin Measure of Sampling Adequacy: .187. Bartlett's Test of Sphericity: Chi-Square 1633.230, df 465, P<.001. All scales were measured using a 7-point Likert scale.

Pilot Study: Discussion

This pilot study aimed to investigate the general demographic profile and examine the reliability and validity of the instruments. To identify the internal consistency between the measurement items, this pilot study examined Cronbach's alpha and CITC. The results demonstrated the consistency of measurement items. To investigate the construct validity of the measurement, this pilot study conducted an EFA. Because this study includes items that are newly modified in the context of metaverse tourism, this pilot study executed exploratory analysis to understand the overall factor structure. The results suggested further attention and modification of some items that showed lower factor loadings. The forthcoming study adjusts the items to represent more specific to the context of travel and metaverse.

Main Study: Data Collection

In order to enhance the validity of the study, the main research conducted modifications to the instrument items based on the findings of the pilot study. Specifically, the author adjusted items related to perceived usefulness, perceived ease of use, perceived enjoyment, and expected satisfaction. These modifications were implemented to ensure stronger validity and improve the accuracy of the measurement of these constructs. To facilitate a multi-model comparison of technology acceptance, several measurement items were added to the existing items for perceived enjoyment, expected satisfaction, and situational motivation. Additionally, measurement items for novelty seeking, job relevance, and subjective norm were introduced. These additions expanded the total number of measurement items for a comprehensive evaluation and comparison of different models of technology acceptance. The modified version of the instrument items used in this study is presented in Table 7.

The study incorporated an informed consent form that encompassed the study's purpose, estimated duration, data collection, confidentiality, potential risks, and contact details of the researchers. Participants were presented with the choice to agree or disagree to participate by simply clicking on the respective option. If a participant chose to disagree, their response would be promptly returned and left unsaved. Upon agreeing to participate, participants encountered a screen providing a short description of the metaverse and metaverse tourism topics. They were requested to read through the description for a minimum duration of 30 seconds and demonstrate their comprehension by clicking the “Yes” button. Responses of “No” would result in their answers being returned and unsaved. To assess attentiveness, an attention check question was placed midway through the survey.

Table 7

Instrument Summary

Construct	Items	Label	References
Computer Self-efficacy	I will be confident in using the metaverse tour platform even if there is no one around to show me how to do it.	SE_1	Aburbeian et al. (2022); Alvarez-Risco et al. (2022); Bandura (1986); Chao (2019); Rondan-Cataluña et al. (2015); Venkatesh and Bala (2008)
	I will be confident in using the metaverse tour platform even if I have never used such a system before.	SE_2	
	I will be confident in using the metaverse tour platform by reading the instructions of reference.	SE_3	
	I will be confident in using the metaverse tour platform if I just have a built-in help facility for assistance.	SE_4	
	I will be confident in using metaverse tour platform if I have used similar technologies before.	SE_5	
	Using the metaverse tour platform is a task I can perform.	SE_6	
	I have the necessary technological skills to use the metaverse tour platform.	SE_7	
	I have sufficient technical skills to use the metaverse tour platform.	SE_8	
Novelty Seeking	People seek my advice on emerging technologies.	NS_1	Kim et al. (2017); Kim et al. (2020); Borhan et al. (2019)
	I am self-sufficient in learning new high-tech products and services.	NS_2	
	I am typically an early adopter of new technologies within my social circle.	NS_3	
	I tend to follow new ideas and experiences.	NS_4	
	I like to experience novelty and make changes in my daily routine.	NS_5	
	I am more interested in using new products and services than others.	NS_6	
	I like to find novel and unfamiliar experiences when things become monotonous.	NS_7	
	I prefer to experience a variety of different activities.	NS_8	
Job Relevance	In tourism-related activity, the usage of metaverse technology will be important.	JR_1	Rondan-Cataluña et al. (2015); Venkatesh and Davis (2000)
	In tourism-related activity, the usage of metaverse technology will be relevant.	JR_2	
	The use of metaverse technology will be pertinent to tourism-related activity.	JR_3	

(table continues)

Construct	Items	Label	References
Subjective Norm	My family and friends will approve me of using metaverse technology for tourism activities.	SNorm_1	Rondan-Cataluña et al. (2015); Venkatesh and Davis (2000)
	I will feel social pressure to use metaverse technology for tourism activities from my social networks (e.g., Facebook and Instagram).	SNorm_2	
	I will trust the recommendations of travel bloggers and influencers who endorse the use of metaverse technology for tourism activities.	SNorm_3	
	I will follow the recommendations of online communities and forums when deciding to use metaverse technology for tourism activities.	SNorm_4	
	I will use metaverse technology for tourism activities if I see my favorite celebrities or influencers using it.	SNorm_5	
	The experiences and feedback of other users will influence my decision to use metaverse technology for tourism activities.	SNorm_6	
Perceived Usefulness	By utilizing the metaverse tour platform, I will access tourism destinations more efficiently.	PU_1	Aburbeian et al. (2022); Chao (2019); Davis (1989); Lin and Chen (2017); Rafique et al. (2018); Rafique et al. (2020)
	The metaverse tour platform will facilitate the search for information related to tourism destinations.	PU_2	
	By using the metaverse tour platform, I will travel to the destination easily.	PU_3	
	The use of the metaverse tour platform will enhance the quality of my travel experience.	PU_4	
	The metaverse tour platform will improve my ability to gather information related to tourism destinations.	PU_5	
	The use of the metaverse tour platform will provide me with increased control over my travel schedule.	PU_6	
	The metaverse tour platform will allow me to explore places that are inaccessible in real life.	PU_7	
Perceived Ease of Use	Learning to use the metaverse tour platform will be easy for me.	PEU_1	Akour et al. (2022); Chao (2019); Davis (1989); Lin and Chen (2017); Rafique et al. (2018); Rafique et al. (2020); Zheng (2020)
	I will find it easy to accomplish what I want to do with the metaverse tour platform.	PEU_2	
	Interacting with the metaverse tour platform will be clear and easy.	PEU_3	
	I will find the metaverse tour platform to be flexible to interact with.	PEU_4	
	It will be easy to become skillful at using the metaverse tour platform.	PEU_5	
	Learning the metaverse tour platform will be effortless.	PEU_6	

Construct	Items	Label	References
	The procedure of using the metaverse tour platform will be easy to learn.	PEU_7	
	The process of using the metaverse tour platform will be easy to operate.	PEU_8	
	It will be easy to remember how to use the metaverse tour platform.	PEU_9	
Perceived Enjoyment	I will enjoy using the metaverse tour platform.	PEJ_1	Chao (2019); Lin and Chen (2017); Rondan-Cataluña et al. (2015)
	Using the metaverse tour platform will be fun.	PEJ_2	
	The actual process of using the metaverse tour platform will be pleasant.	PEJ_3	
	The immersive and interactive aspects of the metaverse tourism activities will be entertaining.	PEJ_4	
	The metaverse tour platform will be stimulating.	PEJ_5	
	Using the metaverse tour platform will elicit positive emotions in me.	PEJ_6	
	The metaverse tour platform will provide a sense of adventure and exploration.	PEJ_7	
Expected Satisfaction	The metaverse tour platform will offer many benefits.	SAT_1	Akour et al. (2022); Chao (2019); Lin and Chen (2017); Zheng (2020)
	The metaverse platform will have great value in the tourism context.	SAT_2	
	The efficiency of metaverse tour platform will be satisfactory.	SAT_3	
	The metaverse tour platform will provide a satisfactory experience.	SAT_4	
	I generally support the use of the metaverse tour platform.	SAT_5	
	The metaverse tour platform will be advantageous.	SAT_6	
Situational Motivation	I often stop and think about the situation that might prevent my travel.	SIT_1	Aldoory and Sha (2007); Grunig (1997); Kim et al. (2010); Zheng (2016)
	I often stop and think about what I can do to help with the situation that might prevent my travel.	SIT_2	
	I have curiosity about the situation that might prevent my travel.	SIT_3	
	I frequently contemplate potential barriers that could impede my travels and how to overcome them.	SIT_4	
	I am curious about potential obstacles that could impact my travel plans.	SIT_5	
Behavioral Intention	I plan to use the metaverse tour platform in the future.	BEH_1	Alvarez-Risco et al. (2022); Chao (2019); Davis (1989); Lin and Chen (2017); Rafique et al. (2020)
	Assuming I have access to the metaverse tour platform, I intend to use it.	BEH_2	
	Assuming I have access to the metaverse tour platform, I predict that I will use it.	BEH_3	
	I am interested in using the metaverse tour platform.	BEH_4	

This involved a straightforward question such as “Which of the following is not a color?” with the correct response being “Chair.” Participants providing an incorrect answer would have their responses returned and left unsaved.

Data collection for this study took place during the period of May 2023. This study employed the online survey platform known as Prolific, which maintains a substantial global participant pool. Prolific facilitated access to participants who met specific criteria, including fluency in English, prior experience with VR, AR, and mixed reality, and regular usage of VR headsets at least once a month. To ensure high-quality responses, this study selectively recruited participants with a track record of at least 100 previous submissions and a 90% approval rate. Due to these functions offered by Prolific, the author decided to exclude the screening and general technology literacy questions from the main study. Random sampling was conducted to involve randomly selecting active VR users from a comprehensive list of populations. Out of 5873 participants meeting these criteria, 310 responses were randomly collected. 10 responses were excluded from the study due to various reasons such as being returned, timed-out, or incomplete. The average completion time for participants to respond to all 73 survey questions was 8 minutes and 52 seconds.

The summary of the demographic profile is presented in Table 8. The survey participants' gender distribution is predominantly male (67.7%), with a smaller proportion being female (31.7%). The majority of participants fall within the age range of 20 to 49 (86.1%), with an average age of 37.03. In terms of residency, most participants reside in North/Central America (50.3%) or Europe (39.0%). The highest educational attainment of participants is predominantly high school (31.3%) or a bachelor's degree (51.0%). A significant proportion of participants are single (59.0%). When it comes to the frequency of using VR headsets, the majority of participants reported using them 1-5 times per month

(73.6%), followed by 11-15 times per month (15.1%). Regarding simulated experiences, participants reported engaging in VR (97.0%), AR (51.7%), or Mixed reality (28.7%).

Table 8

Demographic Profile

Items		Frequency	%
Gender	Male	203	67.7
	Female	95	31.7
	Non-Binary/Non-Conforming	1	.3
	Prefer not to say	1	.3
Age	Below 20	2	.7
	20-29	77	25.7
	30-39	113	37.7
	40-49	68	22.7
	50-59	27	9.0
	60-69	9	3.0
	Above 70	3	1.0
	Prefer not to say	1	.3
Hometown Location	North/Central America	151	50.3
	South America	1	.3
	Europe	117	39.0
	Africa	2	.7
	Asia	4	1.3
	Pacific Islands	3	1.0
	Other	21	7.0
	Prefer not to say	1	.3
Education	High School	94	31.3
	Bachelor's Degree	153	51.0
	Master's Degree	41	13.7
	Doctoral Degree	8	2.7
	Prefer not to say	4	1.3
Marriage	Yes	120	40.0
	No	177	59.0
	Prefer not to say	3	1.0
VR Headset Usage (Monthly)	1-5 times	220	73.6
	6-10 times	13	4.3
	11-15 times	45	15.1
	More than 15 times	21	7.0

(table continues)

Items		Frequency	%
Simulated Experiences (Multiple Response)	Virtual Reality	291	97.0
	Augmented Reality	155	51.7
	Mixed Reality	86	28.7
	Other	7	2.3

CHAPTER 4

RESULTS: MAIN STUDY DATA ANALYSIS

This study assessed the reliability and validity of the factors measured using multiple items derived from existing literature on metaverse and technology acceptance. Reliability testing was conducted to examine the internal consistency among the measurement items. Cronbach's alpha coefficient was calculated to assess measurement consistency, with a value of 0.6 or higher considered acceptable for newly developed or inclusive items (Nunnally, 1978). Additionally, the corrected item-total correlation (CITC) was analyzed to evaluate the correlation between each item and the remaining items. A CITC value of 0.4 or higher indicated internal consistency with the underlying concept. The results of the reliability test, summarized in Table 9, demonstrated that all factors exhibited acceptable Cronbach's alpha coefficients, indicating measurement consistency and reliability.

An exploratory factor analysis (EFA) was performed using the maximum likelihood extraction method and direct oblimin rotation to identify the factor structure, assuming intercorrelation between the constructs. A fixed number of factors with an Eigenvalue of 0.925 were extracted, which moderately met the general standard of an Eigenvalue of 1. Factor loading of 0.3 and an explained cumulative variance of 0.4 were used as criteria for factor evaluation (Bagozzi & Yi, 1988). All items measuring multidimensional constructs were included in the exploratory analysis to determine the factor structure. The results of the exploratory factor analysis, summarized in Table 9, indicated appropriate results, including Bartlett's test of sphericity ($P<0.001$) and the Kaiser-Meyer-Olkin (KMO) measure of sampling accuracy. All items demonstrated satisfactory factor loadings and total cumulative variance.

Table 9

Reliability and EFA

Construct	Label	Cronbach Alpha	Corr Item-Total Corr'l	Factor Loading	Cum Exp Var
Computer Self-efficacy	SE_1	.928	.799	.616	.401
	SE_2		.774	.607	
	SE_3		.788	.661	
	SE_4		.622	.539	
	SE_5		.668	.657	
	SE_6		.772	.757	
	SE_7		.816	.956	
	SE_8		.800	.857	
Novelty Seeking	NS_1	.911	.675	.703	.507
	NS_2		.632	.661	
	NS_3		.775	.805	
	NS_4		.780	.809	
	NS_5		.684	.735	
	NS_6		.800	.846	
	NS_7		.722	.747	
	NS_8		.647	.694	
Job Relevance	JR_1	.951	.899	.909	.571
	JR_2		.897	.925	
	JR_3		.894	.924	
Subjective Norm	SNorm_1	.829	.496	.325	.605
	SNorm_2		.403	.560	
	SNorm_3		.764	.692	
	SNorm_4		.718	.583	
	SNorm_5		.634	.716	
	SNorm_6		.625	.556	
Perceived Usefulness	PU_1	.925	.805	.693	.624
	PU_2		.780	.688	
	PU_3		.799	.755	
	PU_4		.783	.592	
	PU_5		.771	.622	
	PU_6		.744	.598	
	PU_7		.684	.612	
Perceived Ease of Use	PEU_1	.942	.694	.525	.655
	PEU_2		.739	.422	
	PEU_3		.844	.475	

Construct	Label	Cronbach Alpha	Corr Item-Total Corr'l	Factor Loading	Cum Exp Var
	PEU_4		.762	.421	
	PEU_5		.823	.398	
	PEU_6		.715	.489	
	PEU_7		.842	.410	
	PEU_8		.829	.369	
	PEU_9		.782	.387	
Perceived Enjoyment	PEJ_1	.959	.847	.467	.673
	PEJ_2		.897	.462	
	PEJ_3		.853	.499	
	PEJ_4		.831	.419	
	PEJ_5		.877	.414	
	PEJ_6		.849	.460	
	PEJ_7		.849	.408	
Expected Satisfaction	SAT_1	.945	.849	.828	.684
	SAT_2		.846	.788	
	SAT_3		.824	.833	
	SAT_4		.846	.846	
	SAT_5		.803	.777	
	SAT_6		.839	.830	
Situational Motivation	SIT_1	.946	.851	.879	.699
	SIT_2		.845	.869	
	SIT_3		.842	.872	
	SIT_4		.867	.904	
	SIT_5		.863	.896	
Behavioral Intention	BEH_1	.970	.913	.914	.711
	BEH_2		.937	.949	
	BEH_3		.938	.943	
	BEH_4		.907	.903	

Kaiser-Meyer-Olkin Measure of Sampling Adequacy: .953. Bartlett's Test of Sphericity: Chi-Square 19480.253, df 1953, P<.001. All scales were measured using a 7-point Likert scale.

The purpose of the confirmatory factor analysis (CFA) is to validate a pre-specified measurement model. Unlike EFA, which is used to explore and uncover underlying factors, CFA is utilized to investigate convergent and construct validity and evaluate the model fit between observed data and a hypothesized factor structure. Table 10 presents the results of the CFA. Computer self-efficacy, novelty seeking, job relevance, perceived usefulness, perceived ease of use, perceived enjoyment, expected satisfaction, situational motivation, and behavioral intention factors demonstrated acceptable values for both average variances extracted (AVE) and composite reliability (CR). AVE represents the average amount of variance captured by the indicators of a latent variable and implies a measure of convergent validity, showing how well the observed indicators reflect the latent construct. AVE values above 0.50 are generally considered good and acceptable. CR represents the extent to which the observed indicators reliably measure the latent construct. CR values above 0.60 are considered good and acceptable. Although the AVE of subjective norm fell below the criterion of 0.50, its CR exceeded the acceptable level of 0.60, which is consistent with the cut-off criteria for confirmatory factor analysis (Anderson & Gerbing, 1988).

The analysis also indicated acceptable model fit indices (e.g., CFI, IFI, TLI, SRMR) (Kline, 2005). Comparative fit index (CFI), Tucker-Lewis index (TLI), Incremental fit index (IFI), Normed fit index (NFI), and Relative fit index (RFI) compare the fit of the proposed model to a baseline model with no relationships among variables. A value close to 0.90 is considered acceptable. These five indexes provide a relative measure of the fit improvement achieved by the proposed model.

Standardized root mean square residual (SRMR) estimates the average discrepancy between the observed and predicted correlations or covariances. A value below 0.09 is considered acceptable. Adjusted goodness of fit index (AGFI) measures the proportion of variance and covariance accounted for by the model that considers the degrees of freedom. A value close to 0.90 is considered acceptable.

The root mean square error of approximation (RMSEA) estimates the discrepancy between the proposed model and the population covariance structure. The RMSEA indicated an appropriate 90% confidence interval ranging from .061 to .066 (Fabrigar et al., 1999; Kim et al., 2016). Overall, these findings suggest acceptable model fit and convergent validity.

Table 10

Confirmatory Factor Analysis

Construct	Label	Std Est	AVE	CR
Computer Self-efficacy	SE_1	.826	.622	.929
	SE_2	.815		
	SE_3	.806		
	SE_4	.629		
	SE_5	.680		
	SE_6	.808		
	SE_7	.860		
	SE_8	.853		
Novelty Seeking	NS_1	.726	.570	.913
	NS_2	.671		
	NS_3	.821		
	NS_4	.826		
	NS_5	.714		
	NS_6	.836		
	NS_7	.750		
	NS_8	.673		
Job Relevance	JR_1	.934	.865	.951
	JR_2	.937		
	JR_3	.919		
Subjective Norm	SNorm_1	.648	.479	.841
	SNorm_2	.401		
	SNorm_3	.834		
	SNorm_4	.835		
	SNorm_5	.651		
	SNorm_6	.691		
Perceived Usefulness	PU_1	.846	.642	.926
	PU_2	.815		
	PU_3	.821		
	PU_4	.840		
	PU_5	.802		
	PU_6	.775		
	PU_7	.702		

(table continues)

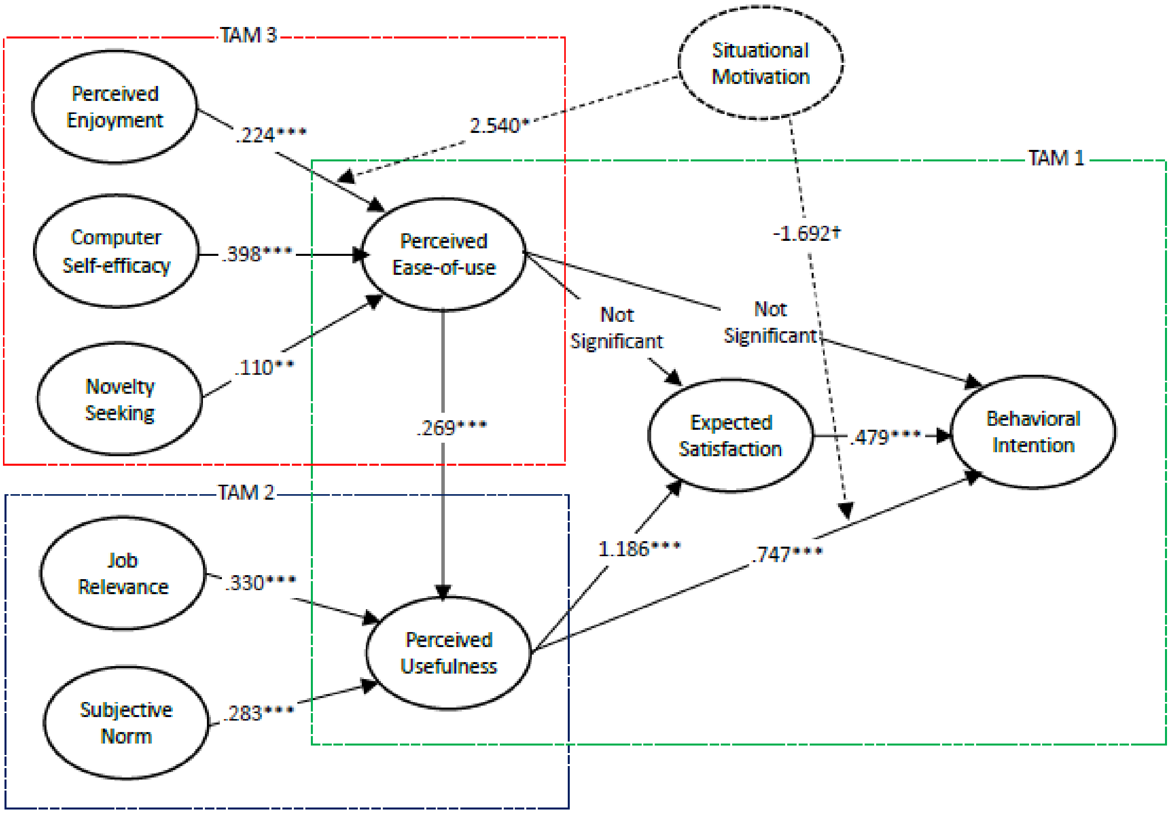
Construct	Label	Std Est	AVE	CR
Perceived Ease of Use	PEU_1	.726	.656	.945
	PEU_2	.770		
	PEU_3	.869		
	PEU_4	.787		
	PEU_5	.850		
	PEU_6	.739		
	PEU_7	.868		
	PEU_8	.852		
	PEU_9	.814		
Perceived Enjoyment	PEJ_1	.877	.773	.960
	PEJ_2	.913		
	PEJ_3	.874		
	PEJ_4	.851		
	PEJ_5	.893		
	PEJ_6	.876		
	PEJ_7	.870		
Expected Satisfaction	SAT_1	.878	.745	.946
	SAT_2	.874		
	SAT_3	.850		
	SAT_4	.866		
	SAT_5	.842		
	SAT_6	.867		
Situational Motivation	SIT_1	.880	.780	.947
	SIT_2	.869		
	SIT_3	.870		
	SIT_4	.902		
	SIT_5	.895		
Behavioral Intention	BEH_1	.934	.890	.970
	BEH_2	.958		
	BEH_3	.955		
	BEH_4	.926		

AVE = average variance extracted; CR = composite reliability. Chi-square=4062.320, df=1845, p<.001. CFI=.884, IFI=.884, TLI=.877, NFI=.807, RFI=.795, AGFI=.659, RMSEA=.063, SRMR=.061.

The objective of this study is to investigate the impact of computer self-efficacy (SE), perceived enjoyment (PEJ), and novelty seeking (NS) on perceived ease of use (PEU), the influence of subjective norm (SNORM) and job relevance (JR) on perceived usefulness (PU), the effect of perceived ease of use (PEU) on perceived usefulness (PU), and the impact of perceived ease of use (PEU) and perceived usefulness (PU) on expected satisfaction (SAT) and behavioral intention (BEH). To examine these relationships, a structural equation model (SEM) was employed using the AMOS software. Table 11 and Figure 2 present an overview of the regression weights for the full model.

Figure 2

Model Overview



***p<.001, **p<.01, *p<.05, †p<.10

Table 11

Regression Weights

Construct		Regression Weight	Std Regression Weight	S.E.	Significance
Dependent	Independent				
PEU	SE	.398	.656	.039	***
	PEJ	.224	.370	.030	***
	NS	.110	.120	.041	**

(table continues)

Construct		Regression Weight	Std Regression Weight	S.E.	Significance
Dependent	Independent				
PU	JR	.330	.677	.033	***
	SNORM	.283	.415	.040	***
	PEU	.269	.276	.048	***
SAT	PU	1.186	.831	.120	***
	PEU	.080	.058	.059	Not Significant
BEH	SAT	.479	.376	.123	***
	PU	.747	.411	.183	***
	PEU	.066	.037	.077	Not Significant

***p<.001, **p<.01, *p<.05, †p<.10

The relationships among the aforementioned constructs were found to be statistically significant, except for the influence of PEU on SAT and BEH. The significant roles of SE, PEJ, and NS in influencing PEU, as well as the significant roles of JR and SNORM in affecting PU were identified.

Table 12

Direct, Indirect, and Total Effects

Path		Unstd Effects	S.E.	Std Effects
Direct Effect	PEU → SAT	.080	.083	.058
	PEU → BEH	.066	.101	.037
	PU → BEH	.747**	.282	.411
Indirect Effect	PEU → PU → SAT	.319**	.075	.229
	PEU → SAT → BEH	.038	.047	.022
	PEU → PU → BEH	.201**	.081	.113
	PEU → PU → SAT → BEH	.153**	.076	.086
	PU → SAT → BEH	.568**	.237	.312
Total Effect	PEU → SAT	.400*	.080	.287
	PEU → BEH	.458*	.108	.259
	PU → BEH	1.314**	.201	.723

***p<.001, **p<.01, *p<.05, †p<.10

In this study, a parametric bootstrapping method was employed, involving 200 iterations, to assess the significance of direct, indirect, and total effects (refer to Table 12).

The findings revealed that the direct effects of PEU on SAT and BEH were not statistically significant. However, these effects became significant when considering the indirect effects of PU and PU * SAT. These results indicate the presence of a serial mediation effect, suggesting that PEU influences SAT and BEH through its impact on PU and PU * SAT, respectively. Additionally, the results indicated a significant direct effect of PU on BEH, as well as an indirect effect of SAT in the relationship between PU and BEH. This suggests the existence of a partial mediation effect between PU and BEH.

In this study, the moderation effect of situational motivation (SIT) was investigated. An average score was calculated and used to categorize participants into either a “high” or “low” SIT group for the moderation analysis. The median score of 5.20 was selected as the criterion for categorizing SIT. The dataset consisted of 153 participants categorized as “high” SIT and 147 participants categorized as “low” SIT, with an even distribution between the two groups. To compare the regression weights and critical ratios for differences between parameters, the author utilized a grouping variable function to categorize the two groups. The moderation effect results are presented in Table 13. Overall, there were no significant differences observed between the two groups, except for the relationships between PEJ and PEU, as well as between PU and BEH. Specifically, when SIT was high, the influence of PEJ on PEU was weaker compared to the low SIT group, although it remained statistically significant. On the other hand, the influence of PU on BEH became stronger and more significant when SIT was high. These findings suggest that SIT moderates the relationships between PEJ and PEU, as well as between PU and BEH.

In this study, various technology acceptance models (TAM 1, TAM 2, TAM 3) were assessed by examining the regression weights, fit statistics, and squared multiple correlations. The TAM 1 model served as the baseline model, while TAM 2 incorporated the additional latent constructs of JR and SNORM on PU. TAM 3 extended the model by including the latent constructs of computer SE, PEJ, and NS on PEU. The introduction of these latent constructs and factor structures is summarized in Table 14.

Table 13

Moderation Effect – Situational Motivation

Construct		Regression Weights		Critical Ratio (z-score)
Dependent	**Independent**	**High**	**Low**	
PEU	SE	.360***	.421***	.771
	PEJ	.138***	.287***	2.540*
	NS	.103*	.103†	.010
PU	JR	.312***	.337***	.394
	SNORM	.270***	.340***	.789
	PEU	.182**	.339***	1.634
SAT	PU	1.123***	1.235***	.470
	PEU	.066	.082	.140
BEH	SAT	.414***	1.093*	1.264
	PEU	.005	.081	.467
	PU	.999***	-.196	-1.692†

***p<.001, **p<.01, *p<.05, †p<.10

Table 14

Model Comparison – Regression Weights

Construct		Regression Weights		
Dependent	**Independent**	**TAM 1**	**TAM 2**	**TAM 3**
PEU	SE			.398***
	PEJ			.224***
	NS			.110**
PU	JR		.334***	.330***
	SNORM		.287***	.283***
	PEU	.636***	.263***	.269***
SAT	PU	1.149***	1.196***	1.186***
	PEU	.087	.065	.080
BEH	SAT	.607***	.484***	.479***
	PEU	.073	.044	.066
	PU	.546***	.753***	.747***

***p<.001, **p<.01, *p<.05, †p<.10

Table 15 presents a summary of the fit statistics for TAM 1-3. The CMIN/DF ratio, which represents the Chi-square divided by the degrees of freedom, is a commonly used goodness-of-fit index to assess how well the model fits the observed data, accounting for model complexity. A lower CMIN/DF ratio indicates a better fit between the model and the data, with a value below 3 generally considered acceptable. The findings indicate that the inclusion of additional latent constructs in TAM 3 resulted in an improvement in the CMIN/DF ratio. This suggests that TAM 3 demonstrated a better fit to the data compared to TAM 1 and TAM 2. Furthermore, other fit indexes, including AGFI, NFI, RFI, IFI, TLI, CFI, and RMSEA, were also enhanced in TAM 3. These fit indexes provide complementary information about the overall model fit. Improvements in these fit indexes in TAM 3 indicate a better alignment between the model and the observed data. The results highlight that TAM 3, with the inclusion of additional latent constructs, showed improvements in various fit statistics, including the CMIN/DF ratio and other fit indexes, indicating a better fit between the model and the data compared to TAM 1 and TAM 2.

Table 15

Model Comparison – Fit Statistics

Model	CMIN/DF	AGFI	NFI	RFI	IFI	TLI	CFI	RMSEA
TAM 1	3.223	.580	.733	.722	.799	.790	.799	.086
TAM 2	3.035	.597	.749	.738	.816	.808	.816	.083
TAM 3	2.859	.619	.764	.754	.833	.825	.832	.079

Table 16 displays the squared multiple correlations for the three models. These correlations represent the proportion of variance in the observed variables that can be explained by the latent variables in a structural equation model. The values of the squared multiple correlations range from 0 to 1. A value of 0 suggests that the latent variable does not explain any variance in the observed variable, while a value of 1 indicates that the latent variable explains all of the variances in the observed variable. Higher values indicate a stronger relationship between the latent variable and the observed variable. The findings reveal that TAM 2 and TAM 3 exhibit an additional explanatory power of the latent constructs representing PEU and PU. The squared multiple correlations in TAM 2 and TAM 3 demonstrate an increased ability to explain the variance in the observed variables related to PEU and PU, suggesting a more comprehensive understanding of the relationships between these constructs.

Table 16

Model Comparison – Squared Multiple Correlations

Construct	Squared Multiple Correlations		
	TAM 1	TAM 2	TAM 3
PEU	.000	.000	.582
PU	.312	.713	.706
SAT	.793	.729	.720

CHAPTER 5

GENERAL DISCUSSION

The results of this study revealed the following important findings. First, it was found that computer self-efficacy (SE), perceived enjoyment (PEJ), and novelty seeking (NS) significantly influenced perceived ease of use (PEU). This finding aligns with the theoretical framework of technology acceptance model 3 (TAM 3) proposed by Venkatesh and Bala (2008). This finding suggests that users' beliefs about their own ability to use technology, their perceived enjoyment, and their desire for novelty can directly influence their perception of how easy it is to use a metaverse tourism platform. This finding expands our understanding of the underlying determinants of perceived ease of use in the metaverse tourism context. Furthermore, this finding provides a practical guideline for user experience designers and developers in creating more user-friendly and engaging metaverse tourism platforms. By focusing on enhancing users' self-confidence, providing enjoyable interactions, and offering novel experiences, platform designers can improve the perceived ease of use, leading to increased user acceptance and adoption. In addition, building users' self-efficacy through training and providing guidance for enjoyable and novel experiences can help overcome any barriers or apprehensions related to metaverse platform usage.

Second, subjective norm (SNORM) and job relevance (JR) were found to have a significant impact on perceived usefulness (PU). This finding aligns with the theoretical frameworks of both TAM 2 (Venkatesh & Davis, 2000) and TAM 3 (Venkatesh & Bala, 2008). This finding demonstrates that users' perceptions of the social influence from subjective norms and the perceived relevance of the platform to their job (i.e., tourism-related tasks) significantly affect their perception of usefulness. This study contributes to the broader understanding of the factors influencing perceived usefulness in the metaverse tourism domain. Furthermore, this finding provides a practical guideline for metaverse platform operators to develop effective user engagement strategies. For instance, facilitating a sense of social approval and promoting positive subjective norms can encourage users to perceive the platform as useful. Additionally, highlighting the job relevance and practical value of the platform (e.g., functionality and destination-oriented information) can enhance users' perceptions of its usefulness for their travel-related tasks. Incorporating collaborative and social features within the metaverse tourism platform can facilitate social interactions and strengthen subjective norms. Thus, enabling users to share their experiences, provide recommendations, and collaborate with others (i.e., social interaction embedded to the technology) can create a sense of community and influence users' perceptions of usefulness.

Third, the direct effect of perceived ease of use (PEU) on expected satisfaction (SAT) and behavioral intention (BEH) was not significant. However, these effects became significant when considering the indirect effects of PU and PU * SAT. This suggests the presence of a serial mediation effect, indicating that PEU affects SAT and BEH by influencing PU and PU * SAT, respectively. This finding empirically supports the overall TAM framework (Venkatesh & Bala, 2008; Venkatesh & Davis, 1996; Venkatesh & Davis, 2000) by highlighting the importance of the sequential relationship of these constructs and providing a deeper understanding of the underlying mechanisms in the adoption and usage of metaverse tourism platforms. By confirming the relationships and mediation effects proposed by TAM, this study contributes to the robustness and generalizability of TAM as a theoretical model for understanding technology acceptance and usage. Furthermore, this finding provides a practical implication to enhance perceived usefulness and user experience. For instance, platform operators can simplify the metaverse platform's interface, improve navigation, and provide adequate user support and training. These can contribute to a smoother and more user-friendly experience, ultimately enhancing users' perceptions of usefulness, satisfaction, and intention to use. The presence of the serial mediation effect suggests that users' perceptions of usefulness play a critical role in shaping their expected satisfaction and behavioral intention. Thus, it is essential to actively gather and incorporate user feedback, suggestions, and preferences into metaverse platform enhancements.

Fourth, perceived usefulness (PU) was found to significantly influence expected satisfaction (SAT) and behavioral intention (BEH). This finding empirically validates the theoretical foundations of the TAM framework by providing evidence of the influence of perceived usefulness on key outcomes (Venkatesh & Bala, 2008; Venkatesh & Davis, 1996; Venkatesh & Davis, 2000) in the context of metaverse tourism. This finding highlights the importance of communicating how the platform fulfills users' needs, solves their problems, or offers unique advantages compared to traditional tourism options. Practitioners can emphasize the metaverse platform's convenience, efficiency, cost-effectiveness, and positive impact on travel experiences. Regular updates, incorporating user feedback, providing personalized and tailored experiences, and continuous improvement based on user preferences and evolving needs can contribute to users' perceived usefulness and increased satisfaction levels.

Fifth, the findings revealed that situational motivation (SIT) acts as a moderator in the relationships between PEJ and PEU, as well as between PU and BEH. Specifically, when SIT was high, the impact of PEJ on PEU was relatively weaker compared to the low SIT group, although it remained statistically significant. Conversely, the influence of PU on BEH became stronger and more significant when SIT was high. Theoretically, the inclusion of situational motivation as a moderator in the TAM framework extends our understanding of technology acceptance by recognizing the influence of contextual factors. This highlights the importance of considering motivational factors in addition to cognitive beliefs and perceptions when examining user acceptance and behavior. Depending on the users' perception of the situation that might prevent their travel, the impact of perceived enjoyment (PEJ) on perceived ease of use (PEU) can be mitigated, while the influence of perceived usefulness (PU) on behavioral intention can be enhanced. For users with high situational motivation, the focus should be on enhancing the perceived usefulness of the metaverse platform, showcasing its value, and facilitating desired behaviors. On the other hand, for users with low situational motivation, efforts should be directed towards emphasizing the enjoyable aspects of the metaverse platform and reducing perceived barriers or complexities. Perceived enjoyment (PEJ) can be reversely influenced by situational motivation (SIT) that emphasizes the utilitarian perspective (i.e., emphasizing the potential risks of travel planning) (Sarkar, 2011). By understanding users' situational motivations, practitioners can identify distinct user segments with different needs, preferences, and motivational triggers. This knowledge can inform targeted marketing strategies, personalized communication approaches, and customized experiences tailored to specific motivational profiles.

Lastly, the incorporation of additional latent constructs in TAM 3 resulted in improvements in various fit statistics when compared to TAM 1 and TAM 2. Moreover, the squared multiple correlations in TAM 3 demonstrated an enhanced ability to explain the variance in the observed variables related to PEU and PU. These findings signify a more comprehensive understanding of the relationships among the essential constructs in the TAM framework and provide a more robust theoretical foundation. The empirical support for the overall TAM framework (Venkatesh & Bala, 2008; Venkatesh & Davis, 1996;

Venkatesh & Davis, 2000), along with the theoretical and practical implications discussed above, provides valuable insights for metaverse platform designers, marketers, and managers.

CHAPTER 6

CONCLUSION

The emergence of metaverse tour platforms has opened up new avenues for delivering immersive and experiential journeys to users, bridging the gap between reality and virtual environments. The metaverse has fundamentally transformed how people experience and engage with travel, offering novel opportunities for individuals whose travel options are limited due to economic, political, or physical constraints.

This study aimed to comprehensively understand metaverse tourism technology, particularly adaptive and context-aware technology, by reviewing existing literature on metaverse tourism. Moreover, the study sought to investigate the key factors influencing the experiential aspects of metaverse tourism. Specifically, the research identified and examined the impact of computer self-efficacy (SE), novelty seeking (NS), subjective norm (SNORM), job relevance (JR), perceived usefulness (PU), perceived ease of use (PEU), and perceived enjoyment (PEJ) on user satisfaction (SAT) and behavioral intention (BEH) within the metaverse tourism context.

The influence of underlying factors such as perceived ease of use (PEU) and perceived usefulness (PU) was found to be substantial in this study. Perceived usefulness (PU) significantly influenced expected satisfaction (SAT) and behavioral intention (BEH). Additionally, the effects perceived ease of use (PEU) on expected satisfaction (SAT) and behavioral intention (BEH) became significant due to the presence of a serial mediation effect. Furthermore, situational motivation (SIT) moderated the relationships between PEJ and PEU, as well as between PU and BEH. When SIT was high, the impact of PEJ on PEU was relatively weaker, while the influence of PU on BEH became stronger and more significant. These findings have significant implications for theory and management, addressing various questions related to users' perceptions, expectations, design considerations, stakeholder preparations, and performance assessment of metaverse technology in tourism applications. Specifically, the study investigates users' perception of the feasibility of metaverse technology in tourism, their expectations when utilizing such technology, the design and customization requirements for an effective metaverse tour platform, the necessary preparations for stakeholders to successfully implement metaverse technology in the tourism industry, and approaches for evaluating the performance and effectiveness of the metaverse tour platform by destination stakeholders.

This research contributes to the understanding of metaverse tourism by incorporating key factors from various domains, such as self-efficacy, social influence, and cognitive beliefs, into an extended metaverse technology acceptance model. The findings highlight the significance of these factors in shaping users' perceptions, attitudes, and behavioral intentions toward metaverse tourism platforms. The research underscores the importance of adopting a user-centric approach in the development and promotion of metaverse tourism platforms. By understanding users' cognitive beliefs, motivations, and social influences, platform providers can tailor their offerings to meet users' specific needs, preferences, and expectations. This personalized approach can lead to increased user satisfaction and intention to use, thus driving the success and adoption of metaverse tourism platforms.

Certain limitations should be acknowledged in this study, including the potential for response bias in the quantitative user survey, limitations in sample size and regional bias during data collection, and the possibility of systematic bias in the literature review, data analysis, and findings. To address these limitations and further advance the understanding of technology acceptance in the tourism field, future research should explore the longitudinal effects of metaverse technology adoption in the tourism industry to understand its long-term impact on user behavior and satisfaction; investigate the influence of cultural factors on users' perceptions and expectations of metaverse technology in different tourism contexts; conduct comparative studies across different regions to identify any variations in the acceptance and utilization of metaverse technology; examine the role of user experience design and interface usability in enhancing the acceptance and effectiveness of metaverse tour platforms; and investigate the potential ethical and privacy concerns associated with the use of metaverse technology in the tourism industry and develop guidelines to address these issues. Furthermore, although the present study examined the applicability of the traditional technology acceptance framework, future direction has the potential to expand the scope of the theory by integrating the adjusted model. By exploring these directions, future studies can provide deeper insights into the acceptance and implementation of emerging technologies in the tourism sector, contributing to the development of more user-centric and impactful metaverse applications.

In conclusion, this research offers theoretical advancements and practical implications for metaverse tourism providers by expanding our understanding of the metaverse technology acceptance model and its application in the tourism domain. With its transformative potential, metaverse tourism opens up new frontiers for immersive and accessible travel experiences, transcending the boundaries of traditional tourism.

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