Immersive time in the metaverse and visits to the physical world: why not both? A holistic customer engagement framework

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A holistic customer engagement framework

Abstract

Purpose – Through the theoretical lenses of media richness, perceived realism, and customer engagement, this study investigates the mechanisms that promote customer engagement in metaverse-mediated environments in the meetings, incentives, conferences, and exhibitions (MICE) context, as well as the impact of customer engagement on customers' metaverse usage intensity and future visit intention.

Design/methodology/approach – A survey of customers who have experience with metaverse-mediated MICE activities was conducted. Data from 267 respondents were analysed using PLS-SEM and fuzzy-set qualitative comparative analysis (fsQCA) to test our research framework.

Findings – Media richness dimensions, including multiple cues, immediate feedback and personal focus, were found to enhance perceived metaverse realism which in turn affects the dimensions of customer engagement, leading to customers' metaverse usage intensity and future visit intention. The fsQCA analysis identifies three configurations that lead to high event visit intention.

Practical implications – This research helps developers and marketers better understand how rich media contents create realistic experiences in the metaverse, aiding them to devise strategies for customer engagement and improve resource allocation.

Originality/value – Despite its potentially revolutionary impacts, empirical studies on the mechanisms driving customer engagement in the metaverse and its effects are scarce. This study contributes by revealing the multiple-phase mechanism of the customer engagement journey in the metaverse-mediated MICE context. By expanding the media richness theory into

this area, our study provides new insights by illustrating how media richness dimensions create multisensory experiences and real-time interactions, enhancing perceived metaverse realism and customer engagement. It also addresses the debate on whether metaverse-mediated events substitute or complement real-life events.

Keywords: Metaverse, media richness, perceived realism, customer engagement, MICE

1. Introduction

The metaverse is considered the next generation of information communication technology in the era of Web 3.0, which integrates the frameworks of the Internet and social media into an online three-dimensional virtual world (Gursoy *et al.*, 2023). The metaverse refers to a shared virtual space that people can navigate to participate in various activities and interact with their virtual friends through their personalised avatars (Ahn *et al.*, 2022). Utilising immersive technologies, such as virtual reality (VR), augmented reality (AR) and mixed reality (MR), developers create metaverse-mediated environments consisting of highly emulated subjects, objects, and activities, which empower customers to participate in various activities and interact with other actors through avatar embodiments (Gursoy *et al.*, 2023). Prime examples include participating in virtual events (e.g., exhibitions, concerts, festivals and sports matches), visiting destinations and attractions (e.g., museums, cultural heritage and street attractions), and attending virtual conferences (Buhalis and Karatay, 2022; Yang and Wang, 2023). Metaverse-mediated environments allow customers to interact with different actors, such as marketers, event hosts, tour guides, influencers and other customers, and engage in real-time experience sharing (Buhalis, O'Connor, *et al.*, 2022).

According to recent studies, as customers get used to participating in virtual-based events since the outbreak of COVID-19, marketers have increasingly utilised immersive technologies to organize MICE activities to connect with customers across the world without geographical boundaries (Buhalis, O'Connor, *et al.*, 2022). By utilising rich media contents supported by the metaverse, marketers create multisensory experiences for customers to participate in MICE activities in metaverse-mediated environments (Flavián *et al.*, 2019, 2021). Despite the promising development and growing importance of the metaverse in the tourism and hospitality industries, empirical understanding of its effectiveness in triggering positive outcomes, including metaverse usage intensity and future visit intention, remains limited. This limitation

creates difficulties for marketers to devise effective strategies to engage customers in metaverse-mediated MICE activities and improve resource allocation. Thus, we are motivated to explore the following research question: How can marketers effectively drive customers' metaverse usage intensity and future visit intention? We attempted to address this research question by exploring the multiple phases of the customer engagement journey in the metaverse (Ahn *et al.*, 2022; Buhalis *et al.*, 2023).

Customer engagement is inseparable from marketers' ability to create real-world-like virtual environments that empower customers to see, hear and feel, along with engaging in realistic interactions with actors in the metaverse-mediated environments as if they were in the real world (Flavián *et al.*, 2019). To assess the importance of real-world-like metaverse-mediated environments in facilitating customers' engagement journey, it is also important to understand how rich media contents facilitate perceived metaverse realism. Given the potential importance of rich media contents, recent studies have called for empirical research on the impact of rich media contents in facilitating realistic metaverse-mediated environments (Ahn *et al.*, 2022). Drawing upon the customer-metaverse engagement framework proposed by Ahn *et al.* (2022) and on the media richness theory (MRT) (Trevino *et al.*, 1987), we posit that perceived metaverse realism, which is denoted as the degree to which the metaverse representation relates to real-world experiences (Daassi and Debbabi, 2021), is influential in driving customer engagement, which in turn facilitates positive customer behaviours in and out of the metaverse (Ahn *et al.*, 2022). Arguably, rich media contents are useful in reproducing real-life-like environments that empower customers to experience virtually-reality amalgamated events through metaverse-mediated environments as if they were in the real world (Mladenović *et al.*, 2023). Based on MRT (Trevino *et al.*, 1987), this study has identified four media richness dimensions, including multiple cues, immediate feedback, personal focus, and language variety and examined their effects on the perceived metaverse realism and customer engagement.

This study contributes to the marketing literature by showing the multiple-phase mechanism of the customer engagement journey in the metaverse-mediated MICE context. Our research framework is underpinned by the MRT, perceived realism and customer engagement, providing meaningful implications for demonstrating the effects of various MRT dimensions on perceived metaverse realism, which in turn drives customer engagement. An additional contribution is made by exploring the importance of customer engagement dimensions in driving customers' behaviours in and out of the metaverse, as manifested by metaverse usage

intensity and future visit intention. Lastly, this study also sheds light on the metaverse literature by confirming the positive relationship between metaverse usage intensity and future visit intention. These findings provide meaningful implications for developers and marketers who wish to engage with customers by creating authentic experiences in the metaverse-mediated MICE context.

2. Theoretical background

2.1. Media richness theory

Media richness theory offers a framework for understanding customer experiences in the metaverse by focusing on communication channels' ability to convey information effectively (Daft and Lengel, 1986). According to MRT, channels vary in their ability to convey rich information, helping users achieve personalised goals and resolve message ambiguities (Tseng *et al.*, 2017). Tasks dictate the choice of communication channels, with simple tasks favouring low-richness media and complex tasks requiring richer content (Trevino *et al.*, 1987). In the context of MICE activities, where interactions are complex, customers gravitate towards rich media for effective communication. The metaverse, with its capacity for high-richness media, is increasingly utilised by marketers to create immersive experiences and continuous interactions through avatars (Ahn *et al.*, 2022). Thus, media richness plays a pivotal role in fostering real-life-like metaverse environments that enhance customer engagement, meriting further research attention.

According to MRT, media richness consists of four components: multiple cues, immediate feedback, personal focus and language variety (Tseng *et al.*, 2022). Multiple cues represent the ability of channels or technology platforms to disseminate a variety of information cues with explicit and implicit meanings, including verbal cues featuring spoken word, voice inflection, and video chats, along with nonverbal expressions, such as facial expression, distancing, body language and body movements. Immediate feedback is the ability of channels or technology platforms to provide timely feedback and allow users to respond to the messages received promptly. Personal focus is the ability of channels and technology platforms to enable customised messages based on users' specific needs or situations. Language variety is the ability of a communication medium to use rich and varied languages (e.g., text, symbols, photos, videos, audio, links and other multimedia data) to convey

information. These dimensions aid in conveying rich messages, fostering real-time interactions and knowledge exchange in virtual environments.

Utilising immersive technologies, marketers create rich media in metaverse environments, three-dimensional virtual spaces where customers control avatars to convey messages with human-like emotions via emojis, texts, voice, and actions (Ahn *et al.*, 2022). These human-like messages create multisensory experiences, allowing customers to explore different aspects of life and simulate real-life events, fostering imagination about real-life experiences (Flavián *et al.*, 2021). Customers can use personalised avatars to participate in real-world-like events (e.g., concerts, and exhibitions tailored to their needs) and gain real-world knowledge, integrating virtual experiences across centuries and geographic boundaries (Gursoy *et al.*, 2023). When marketers empower customers to interact using rich media (e.g., verbal communication, video sharing, body language), these multisensory experiences serve as authentic pre-experiences, strengthening psychological connections and behavioural intentions (Flavián *et al.*, 2019). Recent studies highlight the need for marketers to enhance the richness of metaverse content, creating multisensory experiences that simulate real-world scenarios, thereby fostering authentic enjoyment and enhancing customer engagement (Ahn *et al.*, 2022). While MRT is suitable for exploring customer experiences in the metaverse (Mladenović *et al.*, 2023), the mechanisms through which rich media content generates multisensory and authentic experiences (perceived metaverse realism) and its impacts on customer engagement in and out of the metaverse require further investigation. Thus, we examine the significance of the four dimensions of media richness in understanding how they contribute to authentic experiences.

2.2. Real-life-like environment in the metaverse - perceived metaverse realism

Perceived realism is an important concept in media studies to explain how media content persuades, attracts and motivates customers (Busselle and Bilandzic, 2008). The concept of perceived realism has evolved alongside technological advancements, encompassing customers' assessments of media representation, video games, VR technologies, and the metaverse. In traditional media contexts, realism is gauged by the extent to which media content replicates real-world experiences (Cho *et al.*, 2014). In the context of video games, realism is attained when players immerse themselves in unique virtual environments, enabling them to manipulate game elements to achieve their objectives, including creating characters, selecting storylines, and interacting with fellow players. (Ribbens *et al.*, 2016). In VR

technologies, high perceived realism occurs when customers are immersed in virtual environments that enable them to interact with objects, altering colours, shapes, and positions as they choose (Flavián *et al.*, 2019). Here, perceived realism is not only evaluated by its audio-visual reality but manifested by the ability of virtual-mediated subjects, objects and activities to simulate real-life contexts.

In the context of the metaverse, scholars suggest that realism is manifested by its distinctive features that support customers' second-life experiences (Gursoy *et al.*, 2023). More specifically, metaverse-mediated experience is perceived as realistic when customers are empowered to utilise their personalised avatars to participate in real-world-like environments and engage in genuine interactions (Ahn *et al.*, 2022; Yang and Wang, 2023). Customers are empowered to tailor their experiences based on their interests and to explore different stories, scenarios and events without boundaries in highly simulated metaverse-mediated environments. These environments enable them to obtain knowledge about the real world. This will then create multisensory stimulation for customers to imagine how real-world events might unfold (Flavián *et al.*, 2021), which in turn increases their intention to spend more time in such environments (Buhalis *et al.*, 2023). Based on the aforementioned, this study defines perceived metaverse realism as the degree to which the avatars can represent themselves to control their experiences in metaverse-mediated environments. Given its importance, recent studies have suggested marketers to create rich media contents to create real-life-like experiences for customers (Ahn *et al.*, 2022; Gursoy *et al.*, 2023; Mladenović *et al.*, 2023), which in turn facilitates customer engagement journey in the metaverse.

2.3. Customer engagement in the metaverse-mediated environment

Customer engagement is arguably inseparable from marketers' ability to create realistic virtual environments (e.g., objects, stories, events, activities, characters and avatars) that allow customers to have realistic experiences (Hollebeek *et al.*, 2020). Customer engagement is generally conceptualised as customers' psychological state reflected by their cognitive, emotional and behavioural activities when interacting with virtual environments (Harrigan *et al.*, 2017). Specifically, customers' cognitive efforts are indicated by their levels of absorption, while emotional attachment is indicated by their level of enthusiasm. In addition, behavioural activities are manifested by their participative behaviours in virtual environments (Harrigan *et al.*, 2017; Ndhlovu and Maree, 2022).

As customer engagement is largely driven by dynamic technological environments that can effectively motivate customers to be psychologically connected and invest their resources in interacting with the focal object, customers' engagement with virtual platforms is argued to be reflected by their absorption, affection and participation (Hollebeek *et al.*, 2020; Ndhlovu and Maree, 2022). Absorption is a customer's immersion in the metaverse, which is manifested by their attention and involvement in the metaverse-mediated environment (Cheung *et al.*, 2015). Affection refers to customers' emotional attachment and enthusiasm towards the metaverse-mediated environment (Harrigan *et al.*, 2017). Participation is the amount of resources invested by customers in interacting with different actors, which creates value for the metaverse-mediated environment (Ndhlovu and Maree, 2022).

Highly engaged customers tend to invest considerable time, energy and effort in the metaverse-mediated environment, which increases their intention to attend events in the physical world. Recognizing the importance of customer engagement, this study explores the multiple stages of customer engagement in the metaverse.

3. Research framework and hypothesis development

3.1. Relationship between media richness and perceived metaverse realism

Metaverse-mediated environments allow customers to control their avatars to convey verbal information using various communication messages, such as text, voice, videos, links, images and animations, and nonverbal expressions using body language, gestures and postures, to transmit rich meanings, ultimately enhancing social connectedness and enjoyment (Mladenović *et al.*, 2023; Tseng *et al.*, 2022). Rich media contents with multiple cues (e.g., text, pictures, sound, and motion) are vital in creating multisensory pre-experiences in virtual environments, which in turn improve the perceived authenticity of virtual-mediated experiences (Ahn *et al.*, 2022).

Previous studies suggest that multiple cues facilitate customer collaboration with various actors (e.g., like-minded peers and event hosts) to gather rich information and establish authentic social connections in virtual-mediated environments, thereby enhancing their understanding of the real world. Han *et al.* (2020) found that customers enjoyed the realistic experience in VR shopping when they could use nonverbal expressions (e.g., body movements, postures and actions). Flavián *et al.* (2021) found that haptic cues (e.g., touch, feel and

movements), facilitated by technological embodiment, are influential in resembling real-life experience, which in turn creates authentic pre-experiences for customers to "taste" their interested destinations before actual visitation. In the metaverse, customers engage and collaborate with various actors using multiple cues to achieve realistic goals, such as cultural heritage exploration, participation in exhibitions, and discussions on real-world issues in virtual conferences (Ahn *et al.*, 2022). Therefore, metaverse-mediated events are perceived as authentic when customers utilise verbal and nonverbal cues to interact with actors and objects, leading to the following hypothesis:

H1: Multiple cues are positively associated with perceived metaverse realism.

Metaverse-mediated environments allow actors to engage in real-time interactions, enabling customers to share their ideas and experiences promptly (Buhalis *et al.*, 2023). Real-time interactions can be facilitated by empowering customers to share immediate feedback during their journeys, which in turn increases the perceived authenticity of metaverse-mediated events (Buhalis, Lin, *et al.*, 2022). For example, when customers are empowered to receive, share and modify the contents of metaverse-mediated events in a timely manner, they are motivated to engage in real-time interactions to actively discuss the details of events with other actors, which in turn facilitates customers' imagination of how real-life events will unfold. In addition, real-time interaction via communication with other actors using timely messages (e.g., texts, pictorial contents or voice) generates experiential value, which improves customers' knowledge about the details of real-life events.

The importance of immediate feedback in facilitating real-time interaction that enhances the perceived authenticity of virtual-mediated experiences is supported by the literature. Martínez-Molés *et al.* (2022) found that when customers are empowered to provide timely messages and feedback in virtual-mediated environments, the real-time interactions and the virtual-mediated experience are perceived as realistic to them as in the real world. In the context of the metaverse, when customers can engage in real-time interactions by sharing their instant ideas, messages, and feedback, these interactions are perceived as genuine and realistic (Mladenović *et al.*, 2023). As such, immediate feedback that facilitates real-time interaction is useful in creating authentic experiences, leading to the following hypothesis:

H2: Immediate feedback is positively associated with perceived metaverse realism.

Metaverse-mediated environments allow actors to customise their messages based on their specific needs or situations, creating a sense of human warmth and authenticity, and enabling customers to express themselves and participate in activities similar to those found in the physical world (Buhalis *et al.*, 2023). Additionally, customers can create and customise their avatars to express personalised feelings and achieve personal goals in the metaverse. This allows them to gain real-world knowledge, such as information about events and exhibitions, and participate in group-based events resembling those in the physical world (Gursoy *et al.*, 2023). As such, personalised experiences are created through technology that supports customised avatars and messages, enhancing the perceived authenticity of virtual-mediated experiences.

Studies have shown the importance of personalised content in virtual environments to create authentic experiences. For example, Cheung *et al.* (2015) found that personalised gaming content influences customers' psychological connectedness, as they control their customised characters to face realistic challenges. In the context of VR tourism, Leung *et al.* (2022) found that customers enjoy realistic destination experiences when they can control the content and visual perspectives of the VR environment based on their specific needs. Tsai (2022) found that personalised metaverse destination tours enhance customers' experience of realistic attractions. Based on the above discussion, we propose that user-centric content enables actors like marketers, tour guides, and customers to customise messages for personal relevance, enhancing real-life experiences of events and destinations. This fosters human warmth and authenticity, leading to the following hypothesis:

H3: Personal focus is positively associated with perceived metaverse realism.

In metaverse-mediated environments, customers control their avatars, enabling them to convey messages verbally and nonverbally through various means, including multilingual text messages, emojis, symbols, non-lexical sounds, and body expressions (Mladenović *et al.*, 2023). Prior studies have demonstrated the importance of language variety in creating authentic experiences in virtual environments. For example, Lin and Chen (2015) demonstrated that an augmented reality query-answering system supporting various languages (e.g., sounds, images,

and animations) empowers customers to acquire knowledge about unique cultures in the physical world. Tseng *et al.* (2022) showed that customers are willing to use different languages to express themselves and engage in genuine interactions with like-minded peers in online games, thus creating a sense of human warmth in the online gaming environment. Buhalis and Karatay (2022) proposed that when customers are supported in utilising varied languages to interact with other actors (e.g., marketers, influencers, and tour guides) in metaverse-mediated environments, they are motivated to participate in group-based activities that enable them to fulfil their goals in the physical world. In summary, research has demonstrated the importance of using languages (e.g., text, images, videos and physical senses) in facilitating real-life-like interactions and creating realistic event experiences (Buhalis and Karatay, 2022; Tseng *et al.*, 2022), leading to the following hypothesis:

H4: Language variety is positively associated with perceived metaverse realism.

3.2. Relationship between perceived metaverse realism and customer engagement

Metaverse-mediated environments provide customers with experiences using VR integration, allowing them to develop interpersonal relationships with other actors, participate in activities, and contribute to virtual events by controlling their avatars (Yang and Wang, 2023). The degree of authenticity produced by metaverse-mediated environments contributes to customers' experiential value, creating multisensory experiences (e.g., seeing, hearing, touching, and feeling) for customer enjoyment (Flavián *et al.*, 2021). This, in turn, increases their intention to exert cognitive efforts, becoming deeply engrossed and actively participating in metaverse-mediated events (Ahn *et al.*, 2022).

Empirical studies have shown that high-verisimilitude virtual environments increase customers' psychological connectedness, supporting the link between realism and customer engagement. Customers are more likely to be immersed in virtual environments when the experience is authentic and resembles the physical world. Kim and Ko (2019) found that customers were totally focused on VR sports games when the virtual environments and activities are perceived as authentic and can resemble real-world sports events. Kim *et al.* (2020) found that authentic VR tourism activities are meaningful stimuli for triggering customers' flow state and enjoyment. Ahn *et al.* (2022) argued that customers are likely to be

immersed in the metaverse when they are empowered to utilise immersive technologies to participate in real-life-like events. Given the above, we suggest that customers immerse themselves deeply in metaverse-mediated events perceived as realistic, resulting in the following hypothesis:

H5: Perceived metaverse realism is positively associated with absorption.

Prior studies have demonstrated the positive relationship between authentic virtual experiences and customers' positive emotions. For example, Martínez-Molés *et al.* (2022) found that customers are satisfied and enjoy experiencing cruise vacations with VR when they discover that they can have similar cruise-related experiences in VR-mediated environments as they do in real life. Yu *et al.* (2023) found that virtual tourism heightens multisensory experiences, mimics real-world destinations and increases perceived enjoyment, thus enhancing destination knowledge. Furthermore, there have been propositions predicting the associations between authentic experiences and affection in the metaverse context (Ahn *et al.*, 2022; Gursoy *et al.*, 2023). Thus, we hypothesize that:

H6: Perceived metaverse realism is positively associated with affection.

Authentic virtual experiences are found to be vital in encouraging customers' participation because customers are likely to enjoy and become emotionally involved in participating in virtual-mediated activities when they believe the virtual-based experiences can resemble the physical world. Kim *et al.* (2020) found the importance of authentic VR tourism experiences in driving customers' enjoyment, which in turn strengthens their involvement in VR tourism activities and motivates them to participate continuously. Notably, there have been propositions predicting the importance of authentic experiences in driving customers' participation in the metaverse context. Ahn *et al.* (2022) suggested marketers utilise immersive technologies to create multisensory experiences for customers, which in turn drives customer participation in metaverse-mediated events. Based on the discussion above, we posit that customers who believe that metaverse-mediated environments simulate events similar to those

in the physical world are more willing to participate in metaverse-mediated events than other customers, leading to the following hypotheses:

H7: Perceived metaverse realism is positively associated with participation.

3.3. Relationship between customer engagement with metaverse usage intensity and future visit intention

Immersive metaverse time is conceptualized as customers' conscious, deliberate and dedicated time spent on engaging with metaverse-mediated environments (Mogaji *et al.*, 2023). Despite its conceptual importance, empirical evidence exploring its measurement and mechanisms that increase immersive metaverse time is yet to be explored. Based on Van Doorn *et al.*'s (2010) customer engagement framework, customers' immersive time spent in virtual-mediated environments is manifested by their usage intensity which is measured by duration, frequency and recency of usage (Cheung *et al.*, 2015; Suh, 2023). In this study, customer engagement dimensions are expected to be positively associated with customers' metaverse usage intensity. Recent studies have argued that when customers are immersed in and enthusiastic about participating in events and activities in metaverse-mediated environments, they are likely to experience realistic events more frequently and spend more time in metaverse-mediated events than other customers (Mogaji *et al.*, 2023; Suh, 2023).

Studies have also proposed that customers' actual usage in virtual environments is driven by their enjoyment of immersive experiences. Cheung *et al.* (2015) showed that highly engaged customers are immersed and deeply engrossed in online games, which increases their frequency and intensity of playing online games. Dincelli and Yayla (2022) highlighted the importance of immersive metaverse experiences in facilitating customer engagement and metaverse usage. Based on the aforementioned, we posit that immersive metaverse experiences are influential in driving customers' metaverse usage, leading to the following hypothesis:

H8: Absorption is positively associated with metaverse usage intensity.

Prior studies have also suggested that customers are likely to use immersive technologies frequently and intensively when they are emotionally engaged with virtual-mediated content. For example, Leung *et al.* (2022) found that passionate customers spend more time in VR-mediated tourism environments because these activities contribute to a positive mood. Suh (2023) found that customers are more likely to use the metaverse frequently and intensively when metaverse-mediated activities are considered exciting and enjoyable. Given the above, we propose that customers' positive emotions drive their metaverse usage, leading to the following hypothesis:

H9: Affection is positively associated with metaverse usage intensity.

Furthermore, recent studies have also demonstrated the importance of customer participation in driving their intensity in using virtual platforms. For instance, Rodríguez-Ardura *et al.* (2023) found that customers use social commerce platforms more frequently when they enjoy sharing their ideas and opinions with peers, indicating that participative behaviours drive stickiness. In the context of the metaverse, Mogaji *et al.* (2023) argued that customers are willing to prolong their immersive time when they enjoy participating in novelty-seeking activities in metaverse-mediated environments. Based on the above discussion, we propose that customer participation significantly drives their metaverse usage intensity, as indicated by their frequency, duration, and recency of event involvement in metaverse-mediated environments, leading to the following hypothesis:

H10: Participation is positively associated with metaverse usage intensity.

Based on the customer engagement framework in the metaverse, highly engaged customers are likely to behave positively in the metaverse and physical world (Ahn *et al.*, 2022; Gursoy *et al.*, 2022). As such, we also argue that customer engagement dimensions play considerable roles in driving customers' future visit intentions. Prior studies have suggested that customers are likely to physically visit a destination when they are immersed and deeply engrossed in virtual-mediated participative activities related to the destination. For example,

Kim *et al.* (2020) found the importance of customers' flow experiences in VR-based tourism activities in driving their future visit intentions. Atzeni *et al.* (2022) showed that highly engaged customers are immersed and deeply involved in heritage-related VR tourism activities, which increases their intention to physically visit the focal heritage destination. Based on the above, we suggest that immersive metaverse experiences enhance customers' future visit intentions, leading to the following hypothesis:

H11: Absorption is positively associated with future visit intention.

Prior studies have also confirmed that customers are willing to physically visit a destination when they are emotionally attached to virtual-mediated destinations. For example, Leung *et al.* (2022) found that customers are willing to physically visit the focal destination when they enjoy participating in VR tourism activities. Lavuri and Akram (2023) found the importance of customers' emotional involvement and enjoyment in VR tourism activities in driving their future visit intention. Based on the aforementioned, customers' emotional engagement with the metaverse is likely to be influential in facilitating their future visit intentions, leading to the following hypothesis:

H12: Affection is positively associated with future visit intention.

Prior studies have also suggested a positive relationship between customers' participative behaviours in virtual-mediated environments and their future visit intentions. Hollebeek *et al.* (2020) argued that customers' social investment positively influences their behavioural intentions, indicating that active participation in VR activities, such as decorating avatars and engaging with peers, increases the likelihood of physical visits to desired destinations. Jung *et al.* (2023) found that interactivity supported by immersive technologies is influential in driving customers' participation in virtual-mediated destinations, which in turn drives their intention to visit the physical destination in the future. In line with these viewpoints, we posit that customers are willing to physically participate in events after engaging with their virtual representations in metaverse-mediated environments, leading to the following hypotheses:

H13: Participation is positively associated with future visit intention.

As metaverse-related research is still in its infancy, the relationship between customers' metaverse usage intensity and future visit intention remains a matter of debate. While some scholars have argued that some of the real-world events and visits are likely to be substituted by metaverse-mediated events (Gursoy *et al.*, 2022), an alternative perspective contends that metaverse-mediated events and activities provide trial experiences for customers, motivating them to participate in real-world events (Buhalis *et al.*, 2023). In this study, we adopt this alternative perspective, suggesting that customers' metaverse usage intensity is positively related to future visit intention. The reason is that MICE activities require marketers and organisers to provide customers with sensory experiences (e.g., hearing, touching, tasting and smelling) to experience the highlights and features of different contextual environments in the real world, which is difficult to fully replicate given the current state of the metaverse (Buhalis, Lin, *et al.*, 2022; Wong *et al.*, 2023). However, it is reasonable to argue that metaverse-mediated MICE activities provide opportunities for customers to interact with different actors enabling them to have a trial experience and then induce actual visits (Flavián *et al.*, 2019). Thus, we hypothesise:

H14: Metaverse usage intensity is positively associated with future visit intention.

Research has shown the mechanism that facilitates highly engaged customers' positive behavioural intentions both within and beyond the virtual setting (Cheung *et al.*, 2015; Leung *et al.*, 2022). Cheung *et al.* (2015) found that highly engaged customers are absorbed and deeply engrossed in online games, leading them to play frequently and intensively, thereby increasing in-game purchases. Similarly, Leung *et al.* (2022) discovered that emotionally engaged customers spend more time in VR tourism environments, boosting their future visit intentions, thereby suggesting that VR stickiness mediates the impact of positive mood on future visit intentions. Moreover, Mogaji *et al.* (2023) argued that prolonged immersive time spent on the metaverse strengthens highly participative customers to behave positively (e.g., purchase and visit) in the physical world. Considering this, it can be argued that metaverse usage intensity mediates the impact of customer engagement dimensions on future visit

intention, indicating that metaverse usage intensity is a necessary antecedent for highly engaged customers to visit or participate in real-world events in the future. Thus, the following hypotheses are proposed.

H15: Metaverse usage intensity mediates the impact of (a) absorption, (b) affection and (c) participation on future visit intention.

4. Research methodology

4.1. Data collection

We adopted a purposive sampling approach to collect data from respondents who had experience using VR technologies to engage with metaverse-mediated environments to obtain information on or participate in activities related to MICE industries in Hong Kong. People who had participated in MICE activities hosted in metaverse-mediated environments, such as Spatial, Decentraland, Sandbox, Innerworld and Roblox, were invited to participate in the online survey. Respondents with no experience of using VR technologies to engage with MICE activities in metaverse-mediated environments were excluded, thereby guaranteeing the relevance of the respondents. Before the start of the survey, the respondents were asked to recall metaverse-mediated events they had attended, such as the types of events (e.g., exhibitions, concerts and conferences etc.), metaverse platforms and interactions involved (e.g., body movements, text messages, emojis, videos and voice messages). During the survey, the respondents were asked to answer questions based on their most familiar metaverse-mediated environment (referred to as 'this metaverse' in the questionnaire).

We rejected 85 responses indicating a lack of experience with using VR technologies to participate in MICE activities in metaverse-mediated environments. After further eliminating 68 incomplete surveys, 267 valid responses were retained for data analysis. ***Appendix 1*** presents the demographic characteristics of respondents.

4.2. Measurement items

We adapted measurement items from previous studies to measure the constructs in our theoretical model using 7-point Likert scales (1 = strongly disagree, 7 = strongly agree). Media richness was operationalised as a multidimensional construct comprising four dimensions: personal focus, immediate feedback, multiple cues and language variety. Each of these

dimensions was measured by three items adapted from Tseng *et al.* (2022). Perceived metaverse realism was measured by five items adapted from Ribbens *et al.* (2016) and Daassi and Debbabi (2021). Customer engagement was conceptualised as psychological engagement and behavioural engagement. Psychological engagement referred to absorption and affection, each was measured using three items adapted from Harrigan *et al.* (2017). Behavioural engagement referred to participation and was measured using four items adapted from Ndhlovu and Maree (2022). Future visit intention was measured by three items adapted from Leung *et al.* (2022). Last, metaverse usage intensity was measured by three items covering duration, frequency and recency adapted from Cheung *et al.* (2015). The measurement items were pre-tested by three IS professors and six experienced metaverse users to ensure consistency of meaning. Modifications to the questionnaire were made to fit the metaverse context after conducting the pre-test.

5. Results

5.1. Common method bias

Common method bias (CMB) may overstate the magnitude of relationships between the constructs in the research model, given the use of self-reported data from a single source. Therefore, we assessed the CMB by examining the correlation among all the constructs in our research model. The results revealed that the constructs' correlation was less than 0.9, suggesting that CMB is not a concern (Hair *et al.*, 2017). Furthermore, we added an unrelated marker variable to the research model to examine the CMB. We then compared the changes in the R^2 values of the endogenous constructs before and after adding the marker variable. For metaverse usage intensity, the R^2 value changed from .545 to .548, and for future visit intention, from .699 to .701. As the differences in R^2 value were insignificant ($\leq$ .10), we can confirm that the questionnaire was not affected by CMB (Lindell and Whitney, 2001).

5.2. Measurement model results

We used partial least squares–structural equation modelling (PLS-SEM) to analyse the collected data. We assessed the measurement items' factor loadings, composite reliability, and Average Variance Extracted (AVE) to assess the reliability and convergent validity of the constructs (See ***Table 1***). The results revealed that the factor loadings of all measurement items

exceeded 0.7, whilst the composite reliability of all constructs exceeded the recommended threshold of 0.7. The AVE for all constructs exceeded the recommended threshold of 0.5, thus confirming convergent validity (Hair *et al.*, 2017). Furthermore, we also assessed the discriminant validity of the measurement model by using the Heterotrait–Monotrait (HTMT) ratio criterion (Henseler *et al.*, 2016), and found all HTMT values lower than the recommended value of 0.9 (See ***Table 2***), confirming the discriminant validity.

Please Insert Table 1 and 2 Here

5.3. Structural model results

We assessed the model fit for the research model using the standardized root mean square residual (SRMR). The results revealed that the SRMR value was .069, lower than the recommended value of .080 (Benitez *et al.*, 2020), and hence the model fit is confirmed.

Additionally, we assessed the research model's predictive relevance (Q2) using the blindfolding procedure (Shmueli *et al.*, 2019). Results showed Q^2 values exceeding zero for perceived realism (Q^2 = .403), absorption (Q^2 = .276), affection (Q^2 = .300), participation (Q^2 = .311), metaverse usage intensity (Q^2 = .306), and future visit intention (Q^2 = .618), indicating satisfactory predictive relevance. Furthermore, we examined the model's predictive power using PLS-predict, evaluating prediction error statistics and root mean square error (RMSE) for all measurement indicators. ***Appendix 2*** displays the results, indicating that for most indicators, RMSE values in the PLS-SEM model were lower than in the linear regression model (LM model), and suggesting moderate predictive power. Overall, the blindfolding procedure and PLS-predict assessment confirmed the research model's predictive capability.

The explanatory power of the research model was evaluated by the coefficient of determination, R^2 values (See ***Appendix 3***). The R^2 values were .666 for perceived metaverse realism, .356 for absorption, .350 for affection, .373 for participation, .545 for metaverse usage intensity, and .699 for future visit intention. The results suggest that the exogenous constructs in the research model adequately explain a meaningful amount of variation in the endogenous constructs.

We examined the hypotheses by checking the standardised coefficient beta values and adjusted p-values based on the Benjamini-Hochberg False Discovery Rate (FDR) control procedure (Benjamini and Hochberg, 1995) to determine the statistical significance of our hypotheses. The false discovery rate was set at 0.05. As presented in ***Appendix 3***, we included age, education, gender, and income as control variables. The results revealed that age and education significantly impact only metaverse usage intensity, and the remaining paths were insignificant.

With the control variables, the results supported 15 of the 17 hypotheses (See ***Figure 1*** and ***Appendix 3***). Regarding the relationships between media richness dimensions and perceived metaverse realism, the impact of multiple cues (β = .480, p = .000) on perceived metaverse realism was the strongest, followed by personal focus (β = .259, p = .000) and immediate feedback (β = .178, p =.042), confirming H1, H2, and H3. However, the relationship between language variety and perceived metaverse realism was not significant (β = .004, p = .958), and hence H4 was rejected. In addition, perceived metaverse realism has significant positive effects on absorption (β = .598, p = .000), affection (β = .594, p = .000) and participation (β = .612, p = .000), confirming H5, H6, and H7.

Regarding the consequences of customer engagement dimensions, the impact of participation (β = .369, p = .000) on metaverse usage intensity was the strongest, followed by affection (β = .206, p = .013) and absorption (β = .135, p = .042), confirming H8, H9, and H10. Relatedly, the impact of participation (β = .359, p = .000) on future visit intention was the strongest, followed by affection (β = .215, p = .028), supporting H12 and H13. In contrast, the impact of absorption (β = .078, p = .237) on future visit intention was not significant, hence H11 was rejected. Lastly, we found that metaverse usage intensity significantly affects future visit intention (β = .275, p = .000), and hence H14 was supported.

Following the mediation-testing procedure as suggested by Hair *et al.* (2017), we found that the indirect effects of affection (β = .057, p = .012) and participation (β = .102, p = .001) on future visit intention through metaverse usage intensity were significant. Given the significant direct effect of affection and participation on future visit intention, it can be concluded that metaverse usage intensity partially mediates the impact of affection and participation on future visit intention. Hence, H15b and H15c were partially supported. We also found a full-mediation effect for metaverse usage intensity in the relationship between absorption and future visit intention. The indirect effect of absorption on future visit intention

through metaverse usage intensity was positive and significant (β = .037, p = .038). However, the direct effect of absorption on future visit intention (β = .078, p = .237) was weak and not significant; thus, metaverse usage intensity fully mediates the impact of absorption on future visit intention (Hair *et al.*, 2017) supporting H15a.

Please Insert Figure 1 Here

5.4. Post-hoc analysis with fuzzy set qualitative comparative analysis (fsQCA)

To add further insights into the PLS-SEM findings, the adoption of fsQCA is warranted. Integrating PLS-SEM with fsQCA presents a promising approach that combines symmetric and asymmetric perspectives simultaneously. This enables the identification of behavioural patterns that may not be evident through a single method, due to the singular reasoning involved. The details of the procedure and results were presented in ***Appendix 4 and 5***, respectively.

We interpreted the intermediate, instead of complex and parsimonious output because it maintains a balance between comprehensiveness and interpretability by concentrating on important configurations (Pappas and Woodside, 2021). As demonstrated in ***Appendix 5***, the fsQCA findings present sufficient configurations with acceptable consistency (> .80) and coverage (> .20) that yield high visiting intention. In fsQCA, the term "consistency" quantifies the degree to which cases possessing a specific configuration result in the same outcome. High consistency suggests the configurations can consistently generate the same outcome, analogous to correlation in the regression method. Conversely, "coverage" indicates the empirical significance of a given configuration. This metric evaluates the proportion of the outcome that is attributable to the configuration, akin to the variance explained in the regression method. As the consistency and coverage values are above the threshold, it implies sufficient relevant empirical evidence yielded by the configuration, and a significant proportion of the targeted outcome (visit intention) can be attributed to the configurations (Pappas and Woodside, 2021). Three configurations were generated. The first configuration indicates that the presence of perceived realism, multiple cues, language variety, immediate feedback, personal focus, absorption, affection, and participation can lead to high visit intention, particularly for male consumers. The second configuration yields a similar combination, with the only difference in adding metaverse usage intensity as a condition. The configuration is not bounded by gender

and age. The third configuration highlights that for the young female group, the presence of perceived realism, multiple cues, language variety, immediate feedback, personal focus, affection, and participation, with the absence of metaverse usage intensity is important in fostering visit intention.

6. Discussion of key findings

The results showed that perceived metaverse realism was driven by three dimensions of media richness: multiple cues, immediate feedback and personal focus. These findings align with prior research on media richness, indicating that rich media content fosters multisensory experiences and promotes interactions among users, fostering a sense of human warmth and enabling sharing and realistic experiences in the metaverse (Tseng and Wei, 2020; Tseng *et al.*, 2022). However, the influence of language variety on perceived metaverse realism was negligible, suggesting that the richness and diversity of languages and symbols may be of lesser importance in assessing metaverse authenticity. This discrepancy may stem from customers' tendency to control their avatars in virtual environments using nonverbal cues such as facial expressions, body language, gestures, and postures to communicate with others. Additionally, as metaverse technologies are still in their early stages, most respondents were early adopters with limited experience in metaverse-mediated environments. They were more inclined to respond to marketer-driven events by controlling their avatars and using nonverbal cues, rather than text and symbols, to communicate with others. Therefore, we propose that metaverse-mediated environments are perceived as realistic and authentic when customers can manipulate personalised avatars to convey personal emotions through various cues in real time.

In addition, our results revealed the effects of perceived metaverse realism on the dimensions of customer engagement, namely absorption, affection and participation, which is consistent with previous findings (Daassi and Debbabi, 2021; Daneels *et al.*, 2018; Kim *et al.*, 2020). The results suggest that customers are likely to be absorbed and deeply engrossed in authentic virtual environments to experience realistic events and be enthusiastic about participating in activities, social interactions and knowledge exchange.

Furthermore, our results indicate a positive association between dimensions of customer engagement and their intensity of metaverse usage. Consistent with previous research on customer engagement, when customers become absorbed and deeply involved in metaverse environments, they tend to spend more time participating in events and activities (Ahn *et al.*,

2022; Suh, 2023). Immersed in virtual worlds, customers often lose track of time and actively engage in various activities, expending significant time, energy, and effort (Cheung *et al.*, 2015). Additionally, our findings show that affection and participation significantly influence customers' future visit intention, supporting the idea that enjoyment and involvement in virtual environments affect actual visitation (Leung *et al.*, 2022). This empirical evidence demonstrates how authentic and immersive experiences in metaverse environments drive positive customer behaviours both within and outside the metaverse.

Our findings provide empirical support for the argument that the frequency and intensity of participation in metaverse-mediated events drive customers' future visit intention. We also found that metaverse usage intensity fully mediated the relationship between absorption and future visit intention, suggesting that highly absorbed customers are not likely to visit the focal event if their metaverse usage intensity is low. In other words, prolonged immersive time spent on the metaverse is influential in strengthening highly immersed customers to behave positively in the physical world (Mogaji *et al.*, 2023). Thus, metaverse-mediated events should not be viewed as substitutes for real-world events but as meaningful trial experiences or pre-visit experiences that increase customers' future visit intention.

The fsQCA revealed interesting non-linear results. First, the finding indicates a gender-based configuration that leads to visit intention. To be specific, for male customers, it has been shown that metaverse attributes are not sufficient on their own to foster high event visit intention, but we argue that incorporating them together is necessary to enhance the overall user experiences, making the event more relatable and accessible. Echoing the PLS-SEM finding, in the presence of perceived realism, multiple cues, language variety, immediate feedback, personal focus, absorption, affection, and participation, the customer experience is enhanced, and this amalgamation amplifies an event's overall appeal and fosters greater interest in visiting the event. Research indicates that different perceptual preferences and interactions exist in males and females regarding interactive immersion (Olya *et al.*, 2020). Evidently, male customers tend to exhibit greater continuous involvement with platforms that apply virtual reality and other cutting-edge technologies in the metaverse (Xu *et al.*, 2023). It can be resonated that males are typically observed participating more frequently in spatial activities and are exposed to a greater degree of "spatial experiences" compared to females, and thus more likely to appreciate metaverse cues and virtual experiences (Aw *et al.*, 2023).

The second configuration suggests a similar combination of causal conditions as the first configuration, with metaverse usage intensity added. The presence of metaverse usage intensity here supports the PLS-SEM finding. This can be attributed to the fact that intensive metaverse usage profoundly influences customers' perceptions and convictions about the authentic event by solidifying comprehensive schema representations within their memory (Mogaji *et al.*, 2023). These resilient cognitive frameworks are important in prompting the anticipation and craving of experiences toward the physical event.

The third configuration is segmented by gender (female) and age (young). Within young female group, the presence of perceived realism, multiple cues, language variety, immediate feedback, personal focus, affection, and participation, coupled with the absence of metaverse usage intensity, foster visit intention. The absence of metaverse usage intensity contradicts the PLS-SEM finding that demonstrates a positive effect. One can conjecture that the ground-breaking yet demanding aspect of the metaverse can potentially lead to mental fatigue with excessive use. Notably, young women, who are in a phase of speedy social and biological maturation, may be more susceptible to mental oversaturation. The continuous and intense engagement may prompt feelings of being overwhelmed or digital fatigue, detracting consumers from the allure of virtual experiences. This finding encourages further reflection on the principles of feelings-as-information theory (Schwarz, 2012), highlighting the importance of engaging consumers' senses using visual, auditory, tactile, olfactory and gustatory stimuli. However, an excessive amount of sensory information and experiences in the metaverse may have adverse effects (Tan *et al.*, 2023). Overall, the intriguing findings uncovered imply that while intensive metaverse usage may enhance real-world activities (future visit intention), specific demographics, combined with other metaverse attributes and experience factors, may exhibit varied configurations leading to the same outcome (future visit intention) without high metaverse usage intensity.

7. Conclusion and implications

7.1. Conclusion

The metaverse, a cornerstone of Web 3.0, is set to revolutionise customer experiences in tourism and hospitality. Yet, research on customer engagement within metaverse-mediated environments remains nascent. To address this, we developed and validated a framework rooted in media richness, perceived realism, and customer engagement. Our study explores

how these factors influence business success in the MICE context (metaverse usage intensity and future visit intention). We found that dimensions of media richness like multiple cues, immediate feedback, and personal focus drive perceived realism, which in turn fosters customer engagement (absorption, affection, and participation), leading to increased metaverse usage and future visit intentions. These findings provide meaningful implications for both scholars and marketers.

7.2. Theoretical implications

This study empirically demonstrates the customer engagement journey in the metaverse and highlights the potential of rich media content to create authentic experiences in metaverse-mediated environments. By integrating theoretical perspectives of media richness, perceived realism, and customer engagement, our research provides a comprehensive framework for understanding the mechanisms driving customer engagement in the metaverse and its impact on positive customer behaviours both within and outside the metaverse.

While previous studies have explored customers' metaverse adoption based on conventional theories, this study provides an additional perspective by examining engagement in the metaverse to understand customer behaviours in and out of the metaverse (Ahn *et al.*, 2022; Buhalis, Lin, *et al.*, 2022). Specifically, this study conceptualises and operationalises customer engagement in the metaverse context, suggesting absorption, affection, and participation as key dimensions that reflect the characteristics of highly engaged customers in a metaverse-mediated environment. Accordingly, this study provides insight into the theory of customer engagement by identifying the characteristics of highly engaged customers in the context of the metaverse, considering participation and affection as key dimensions in driving customers' metaverse usage intensity and future visit intention, which offers avenues for further research on customer engagement in the metaverse.

Although MRT has been suggested as a suitable framework for investigating customers' experiences in the metaverse (Mladenović *et al.*, 2023), empirical studies on the significance of MRT dimensions in enhancing customer engagement remain scarce. While prior research has explored the role of media richness in various contexts such as mobile media behaviours (Tseng and Wei, 2020), social identity in online communities (Shen *et al.*, 2021), and interactivity in online games (Tseng *et al.*, 2022), our study contributes novel insights to tourism marketing by illustrating how media richness dimensions create multisensory

experiences and real-time interactions, fostering perceived metaverse realism and customer engagement. This study extends MRT by showcasing how its dimensions facilitate authentic trial experiences, encouraging customers to engage consistently with metaverse-mediated events using rich media content.

Furthermore, our study sheds light on the debate surrounding whether the metaverse is a substitute or complement to attending real-world MICE events. While it has been suggested that the metaverse has the potential to revolutionise customer experiences by creating realistic virtual activities that can substitute actual visits (Buhalis *et al.*, 2023), our findings suggest that metaverse-mediated experiences can be seen as complementary to, rather than substitutes for real-world events.

From a methodology point of view, the non-linear approach using fsQCA contributes to hospitality and destination marketing in the metaverse by identifying the causal configuration of attributes that underpin successful marketing in the metaverse (Olya *et al.*, 2020). Having adopted a multi-method approach, the key takeaway of our study is that effective hospitality and destination marketing in the metaverse requires not only identifying a single best model but also the combination of different metaverse attributes and metaverse usage intensity ***(See Appendix 4 and 5)***. It is crucial to note that the incorporation of gender and age in the causative model leads to the discovery of gender-specific combinations, paving the way for future research on how an array of metaverse attributes and experiential factor interdependencies are implemented and interact.

7.3. Managerial implications

Based on this study's findings, marketers and developers should invest more resources in enhancing customer engagement in the metaverse to increase usage intensity and actual visitation. To create authentic metaverse experiences, they should focus on developing rich media content and enabling multiple communication cues, personalised feedback, and immediate feedback during metaverse events. For instance, allowing customers to use verbal and nonverbal cues through their avatars and incorporating non-player characters as hosts can enhance real-time communication.

Furthermore, marketers and developers should prioritise verisimilar content and realistic events that bridge the virtual and physical worlds. Events such as concerts and exhibitions spanning centuries and locations can deepen customer engagement and evoke positive

emotions. Importantly, metaverse usage intensity correlates with future event participation, suggesting the need to incentivise customers to spend more time in the metaverse. Loyalty rewards and professional interaction strategies can cultivate a sense of belonging and encourage frequent and intensive participation, ultimately driving future visit intention.

The fsQCA results offer a nuanced perspective, suggesting a segment-focused approach. For male consumers, practitioners should highlight the realism and interactivity of the metaverse experience, alongside other metaverse attributes, to boost physical event visitation. However, a universal strategy, regardless of age and gender, should prioritise metaverse usage intensity alongside other experiential attributes. Conversely, targeting young female consumers with low metaverse usage intensity requires a focus on optimising the metaverse experience rather than increasing usage, which could potentially be counterproductive if overdone.

8. Limitations and future research directions

While this study offers significant insights, it comes with limitations. Firstly, the cross-sectional survey data limits generalisability as it reflects early adopters' perspectives, urging the need for longitudinal research. Secondly, the findings of this study were based on respondents' most familiar metaverse-mediated MICE experiences, overlooking the differences in metaverse-mediated environments and MICE activities. Thus, future research could compare and contrast customers' perceptions of metaverse-mediated MICE activities in controlled settings to enhance the understanding of customers' perceptions in different settings. Thirdly, while examining perceived realism's role, the model could benefit from additional moderators such as personal innovativeness and social influence. Lastly, focusing solely on tourism and events in the metaverse, future research could explore customer engagement across various contexts like retail, gaming, and healthcare environments for a broader understanding.

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Table 1. Results of measurement model

Construct	Loading	*Alpha*	Composite reliability	AVE
Media richness – Personal focus		**.877**	**.925**	**.803**
While using this metaverse, I can create personalized virtual avatars.	.931			
While using this metaverse, I can edit personal profiles and decorate my virtual avatars.	.899			
While using the metaverse, I can share my personal feelings using my personalized virtual avatars.	.857			
Media richness – Immediate feedback		**.887**	**.930**	**.816**
While using this metaverse, I can send/ receive information quickly.	.888			
It does not take long to express my responses to others while using this metaverse.	.912			
I can receive timely feedback from others while using this metaverse.	.910			
Media richness – Language variety		**.919**	**.949**	**.861**
While using this metaverse, I can use a large pool of language symbols/ emoticons to communicate.	.940			
While using this metaverse, I can use varied symbols (e.g., texts, photos, videos, audios and links etc.) to express my ideas.	.933			
While using this metaverse, I can use rich and varied language, along with non-word sounds to express exactly what I mean to say.	.910			
Media richness – Multiple cues		**.887**	**.930**	**.815**
While using this metaverse, I can convey multiple types of information (verbal and nonverbal).	.906			
While using this metaverse, I can communicate with others through verbal means (e.g., spoken words, texts, voice, and video chats).	.897			
While using this metaverse, I can present vivid information using nonverbal expressions (e.g., facial expression, body language and distancing).	.905			
Perceived realism		**.846**	**.890**	**.618**
While using this metaverse, I felt like my avatar was present in the metaverse environment.	.846			
In this metaverse, everything looked impressive.	.761			
The interactions the avatars had in this metaverse were similar to interactions people have in real life.	.752			
By using this metaverse, I can learn something about the real world.	.771			
While using this metaverse, I felt I determined the course of my experience.	.796			

Table 1. Results of measurement model (continued)

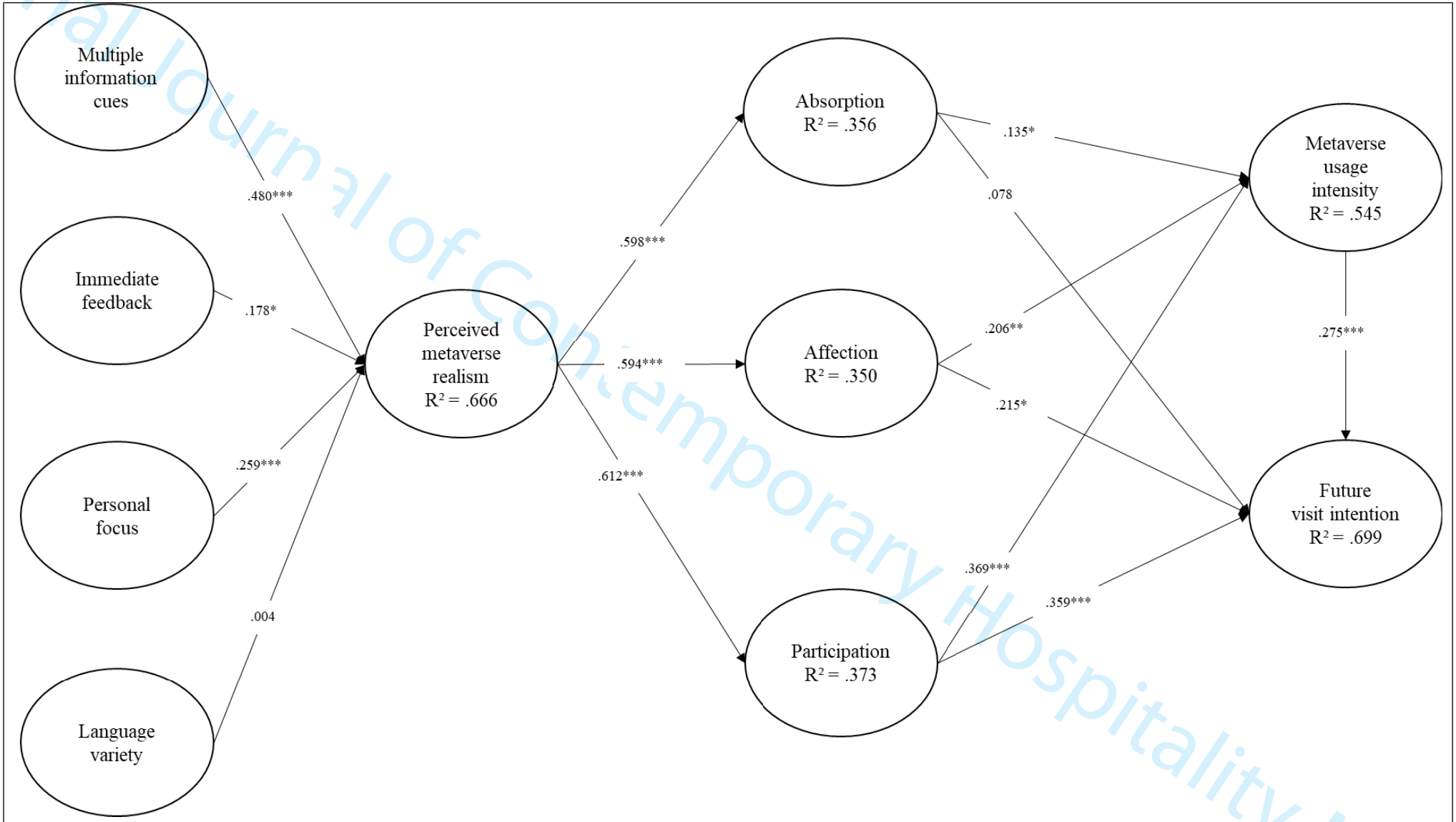
Construct	Loading	*Alpha*	Composite reliability	AVE
Customer engagement - Absorption		**.909**	**.936**	**.786**
Time files when I am using with this metaverse.	.878			
While I am using this metaverse, I get carried away.	.871			
While I am using this metaverse, I forget everything else around me.	.911			
While I am using this metaverse, I am usually absorbed.	.885			
Customer engagement – Affection		**.947**	**.962**	**.863**
I feel excited when I use this metaverse.	.914			
I am passionate about this metaverse.	.929			
I am enthusiastic about this metaverse.	.937			
I love this metaverse.	.935			
Customer engagement – Participation		**.938**	**.955**	**.843**
I exchange ideas with other people about this metaverse.	.910			
I often participate in activities organized by this metaverse.	.917			
I like to get involved in this metaverse.	.935			
I enjoy interacting with others in this metaverse.	.909			
Future visit intention		**.938**	**.961**	**.890**
In the next 3 months, I will plan to visit the event that I experienced in this metaverse.	.948			
In the next 3 months, I will visit the event that I experienced in this metaverse in the near future.	.951			
In the next 3 months, I will invest money and time to visit the event that I experienced in this metaverse.	.932			
Metaverse usage intensity		**.756**	**.847**	**.648**
In the past month, how long have you stayed in this metaverse per visit on average?	.789			
In the past month, how many times have you visited this metaverse per week on average?	.788			
How long ago was your most recent visit in this metaverse?	.837			

Table 2. Discriminant validity: based on HTMT ratio

	ABS	AFF	IF	LV	MU	MC	PART	PMR	PF	FVI
ABS										
AFF	.749									
IF	.667	.616								
LV	.545	.539	.830							
MU	.679	.745	.446	.340						
MC	.526	.490	.735	.687	.353					
PART	.784	.875	.629	.531	.756	.533				
PMR	.666	.651	.773	.697	.455	.883	.676			
PF	.758	.673	.801	.769	.442	.733	.714	.803		
FVI	.713	.802	.488	.365	.788	.374	.840	.521	.561	

Note: HTMT values < 0.90 indicate a satisfactory result for discriminant validity (Hair et al. 2017), ABS = Absorption, AFF = Affection, IF = Immediate feedback, LV = Language variety, MU = Metaverse usage intensity, MC = Multiple cues, PART = Participation, PMR = Perceived metaverse realism, PF = Personal focus, FVI = Future visit intention

Figure 1. Research model.



*Note: *Path significant at the .050 level. **Path significant at the .001 level. ***Path significant at the .000 level.*

Appendix 1. Demographic characteristics of respondents

Variables	Description	(%)	Variables	Description	(%)
Gender	Female	61.0	Experience in using social media platforms	Less than 1 month	0.0
	Male	39.0		1 – 5 months	0.0
				6 – 11 months	7.9
Age	18 -20 years old	23.2		12 – 24 months	19.1
	21 - 23 years old	54.3		25 months or above	73.0
	24 - 26 years old	5.6			
	27 - 29 years old	4.5	Experience in using the metaverse	1 – 4 weeks	43.1
	30 – 32 years old	4.5		5 – 8 weeks	37.8
	33 – 35 years old	4.5		9 – 12 weeks	6.7
	36 – 38 years old	1.5		13 – 16 weeks	9.0
	39 – 41 years old	1.1		17 weeks or above	3.4
	41 – 43 years old	0.0			
	43 – 45 years old	0.0			
	45 years old or above	0.7			
Education	Primary	0.7	Time spent on metaverse (last 3 months)	1 - 10 minutes	55.8
	Secondary	0.7		11 - 20 minutes	28.8
	Tertiary	8.6		21 - 30 minutes	9.0
	Bachelor's degree	76.8		31 - 40 minutes	6.0
	Master's degree or above	13.1		41 - 50 minutes	0.4
Social media usage (per day)	Rarely	9.7	Experience in using XR	1 – 5 times	70.8
	Once daily	7.1		6 – 10 times	10.5
	2 - 5 times	15.7		11 – 15 times	10.1
	6 - 10 times	15.0		16 – 20 times	6.4
	More than 10 times	52.4		21 times or above	2.2

Appendix 2. PLS-predict results

Items	PLS-SEM		LM-RMSE	PLS-SEM-LM-RMSE
	RMSE	Q^2 predict		
ABS1	1.266	0.265	1.176	0.090
ABS2	1.070	0.360	1.077	-0.007
ABS3	1.338	0.234	1.293	0.045
ABS4	1.194	0.271	1.171	0.023
AFF1	1.143	0.315	1.16	-0.017
AFF2	1.188	0.237	1.252	-0.064
AFF3	1.233	0.269	1.227	0.006
AFF4	1.238	0.286	1.252	-0.014
MU1	1.621	0.047	1.674	-0.053
MU2	1.520	0.031	1.567	-0.047
MU3	1.513	0.181	1.453	0.060
PART1	1.281	0.277	1.276	0.005
PART2	1.214	0.297	1.256	-0.042
PART3	1.242	0.326	1.244	-0.002
PART4	1.281	0.301	1.265	0.016
PMR1	0.970	0.446	1.016	-0.046
PMR2	1.149	0.328	1.172	-0.023
PMR3	1.071	0.348	1.105	-0.034
PMR4	1.025	0.428	1.054	-0.029
PMR5	1.047	0.435	1.125	-0.078
FVI1	1.548	0.179	1.561	-0.013
FVI2	1.488	0.209	1.477	0.011
FVI3	1.494	0.163	1.497	-0.003

Note: PMR = Perceived metaverse realism, ABS = Absorption, AFF = Affection, PART = Participation, MU = Metaverse usage intensity, FVI = Future visit intention

Appendix 3. Results of PLS-SEM structural model

Relationship	β	p-value	Adjusted p-value*	R^2
Perceived metaverse realism				
Multiple cues → perceived metaverse realism	.480	.000***	.000***	.666
Immediate feedback → perceived metaverse realism	.178	.027*	.042*	
Personal focus → perceived metaverse realism	.259	.000***	.000***	
Language variety → perceived metaverse realism	.004	.946	.958	
Absorption				
Perceived metaverse realism → absorption	.598	.000***	.000***	.356
Affection				
Perceived metaverse realism → affection	.594	.000***	.000***	.350
Participation				
Perceived metaverse realism → participation	.612	.000***	.000***	.373
Metaverse usage intensity				
Absorption → metaverse usage intensity	.135	.025*	.042*	.545
Affection → metaverse usage intensity	.206	.006**	.013*	
Participation → metaverse usage intensity	.369	.000***	.000***	
Future visit intention				
Absorption → future visit intention	.078	.172	.237	.699
Affection → future visit intention	.215	.015*	.028*	
Participation → future visit intention	.359	.000***	.000***	
Metaverse usage intensity → future visit intention	.275	.000***	.000***	
Age → metaverse usage intensity	.170	.004**	.010**	---
Education → metaverse usage intensity	.108	.015*	.028*	---
Gender → metaverse usage intensity	.006	.884	.958	---
Income → metaverse usage intensity	.059	.112	.164	---
Age → future visit intention	-.002	.958	.958	---
Education → future visit intention	.044	.204	.264	---
Gender → future visit intention	-.005	.875	.958	---
Income → future visit intention	-.026	.486	.594	---

***Note: The adjusted p-value is based on the Benjamini-Hochberg FDR control procedure**
****Path significant at the .050 level. **Path significant at the .001 level. ***Path significant at the .000 level.***

Appendix 4. Procedures and results of fsQCA

The primary objective behind using a multi-method approach comprising PLS-SEM and fsQCA is to offer a more comprehensive and sophisticated comprehension of the intricate causal associations between causal conditions and targeted outcome constructs. Furthermore, the approach facilitates the evaluation of a model's predictive capacity, based on theoretical and logical principles that result in the generation of more practical suggestions for management (Rasoolimanesh *et al.*, 2021). It has been shown that combining fsQCA with other methods, such as SEM can provide complementary insights into understanding the complex and non-linear nature of human behaviour (Aw *et al.*, 2022; Pappas and Woodside, 2021). To begin with, we input perceived realism, multiple cues, language variety, immediate feedback, personal focus, absorption, affection, participation, and metaverse usage intensity as the causal conditions, with visit intention as the targeted outcome. Two control variables were added, namely gender and age, because differences in metaverse interaction may exist between age groups and genders (Xu *et al.*, 2023). Younger consumers could exhibit higher proficiency and comfort in metaverse engagement than their older counterparts. Additionally, there are potentially diverging technological preferences based on gender.

The fsQCA process begins with the calibration of scales. We defined three qualitative thresholds and converted the data into fuzzy set membership levels that range from complete non-membership (0) to full membership (1), with a crossover point of 0.5 (Ragin, 2009). Following the suggestions made by Pappas and Woodside (2021), we utilised the direct calibration method for the 7-point Likert scales, setting thresholds at 6, 4, and 2, to ensure better generalisability and replicability in other similar research scenarios when utilising this approach. Gender was calibrated dichotomously involving assigning a membership score of 1 to females and a score of 0 to males.

The subsequent phase of the analysis involves identifying all potential combinations of causal conditions and examining the consistency of each combination with the targeted outcome. To this end, we constructed a truth table to ascertain configurations that sufficiently contribute to the presence of visiting intention (Pappas and Woodside, 2021). The truth table comprises 2k rows, where k denotes the number of causal conditions. Each row embodies a potential combination of causal conditions. We sorted the truth table by removing rows with two or fewer cases and configurations with a consistency value of less than 0.8 (Rasoolimanesh *et al.*, 2021).

We interpreted the intermediate, instead of complex and parsimonious output because it maintains a balance between comprehensiveness and interpretability by concentrating on important configurations (Pappas and Woodside, 2021). As demonstrated in ***Appendix 5***, the fsQCA findings present sufficient configurations with acceptable consistency (> .80) and coverage (> .20) that yield high visiting intention. In fsQCA, the term "consistency" quantifies the degree to which cases possessing a specific configuration result in the same outcome. High consistency suggests the configurations can consistently generate the same outcome, analogous to correlation in the regression method. Conversely, "coverage" indicates the empirical significance of a given configuration. This metric evaluates the proportion of the outcome that is attributable to the configuration, akin to the variance explained in the regression method. As the consistency and coverage values are above the threshold, it implies sufficient relevant empirical evidence yielded by the configuration, and a significant proportion of the targeted outcome (visit intention) can be attributed to the configurations (Pappas and Woodside, 2021). Three configurations were generated. The first configuration indicates that the presence of perceived realism, multiple cues, language variety, immediate feedback, personal focus, absorption, affection, and participation can lead to high visit intention, particularly for male consumers. The second configuration yields a similar combination, with the only difference in adding metaverse usage intensity as a condition. The configuration is not bounded by gender and age. The third configuration highlights that for the young female group, the presence of perceived realism, multiple cues, language variety, immediate feedback, personal focus, affection, and participation, with the absence of metaverse usage intensity is important in fostering visit intention.

Appendix 5. fsQCA Results

Solution	**Causal conditions** *(Outcome: Future Visit intention)*	**Metrics**				
		Raw coverage	Unique coverage	Consistency	Overall solution consistency	Overall solution coverage
1	PR*MC*LV*IF*PF*AB*AFF*PART*~GENDER	0.315	0.148	0.904	0.869	0.775
2	PR*MC*LV*IF*PF*AB*AFF*PART*MU	0.395	0.002	0.825		
3	PR*MC*LV*IF*PF*AFF*PART*~MU*GENDER*~AGE	0.362	0.231	0.809		

Note: MC= Multiple cues, LV= Language variety, IF= Immediate feedback, PF= Personal focus, PR= Perceived realism, AB= Absorption, AFF= Affection, PART= Participation, MU= Metaverse usage intensity, VI= Visit intention. (*) represent the logical AND. (~) represents the negation or absence of a causal condition.

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