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Article

Metaverse Characteristics: The Role of Consumer Experience Shaping Consumer Behavior in the Metaverse

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Abstract

Understanding consumer behavior in digital environments is increasingly becoming crucial. This study investigates the influence of key metaverse characteristics—sociability, immersiveness, and environmental fidelity—on continuance intention to use the metaverse by examining the mediating role of consumer experience. In study 1, a Delphi method involving 26 experts was employed to establish a consensus on the significance of metaverse characteristics in shaping consumer experience and behavior. In study 2, data from 391 metaverse users were collected via an online survey, and a two-step PLS-SEM approach was used to evaluate the hypothesized relationships. The Delphi study confirmed the theoretical relevance of the identified metaverse characteristics, which were subsequently validated through user data. The results show that consumer experience fully mediates the influence of immersiveness and environmental fidelity on continuance intention and partially mediates between sociability and continuance intention. Necessary Condition Analysis (NCA) further established consumer experience as a prerequisite for continued metaverse use, while importance performance analysis (IMPA) identified sociability as the most influential driver of continuance intention. This study advances our theoretical understanding of consumer behavior in virtual settings and offers practical insights for enhancing consumer engagement and continued metaverse use.

Keywords: sociability; immersiveness; environmental fidelity; consumer experience; consumer behavior; metaverse

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1. Introduction

The metaverse offers a dynamic digital environment for consumer engagement and the exchange of goods and services [1]. At its core, it empowers consumers to actively shape their experience by navigating a variety of products, services, and interactive activities with peers [2], increasingly becoming an integral part of daily life [3]. The metaverse is defined as a novel platform for social interaction, enabling consumers to explore digital spaces through digital identities, often represented by a digital doppelgänger [4]. The growing adoption of digital representation—such as a digital doppelgänger—enhances consumer interaction and drives the adoption of interactive digital technologies. The extant literature on the metaverse highlights the rapid expansion of metaverse-based activities, including socialization, gaming, virtual concerts, and shopping, all facilitated through digital identities [5,6].

Socialization is a fundamental human need that drives individuals to seek connections and social experiences [7]. The metaverse provides a unique digital environment that enhances these experiences by enabling co-creative production and responsive services [8]. It transforms traditional relationships by facilitating escapism, immersion, and interaction, allowing consumers to engage in vivid, simulated, and immersive environments [9]. This immersive quality of the metaverse is evident in the study by Barrera and Shah [10], which identified sociability, immersiveness, and environmental fidelity as key contributors to consumer experience in the metaverse.

Sociability refers to the desire, capability, or skill to collaborate and engage in non-utilitarian activities [11]. It is a foundational element that brings individuals together in the metaverse—an immersive environment that facilitates social experiences for the physical person [12]. For example, the digital doppelgänger, which incorporates eye gaze and hand gestures, can significantly enhance consumer experience and enrich social interactions. These social cues foster sociability and contribute to a heightened sense of immersion, encouraging consumer participation in the metaverse. Sociability plays a crucial role in driving consumers to explore virtual possibilities and form meaningful social connections [5]. Consumers interact with digital actors—such as brands and other consumers—through activities like virtual concerts, fashion shows, music events, and even virtual weddings, all of which reinforce consumer experiences [2]. According to Khan et al. [4], the digital doppelgänger is a key facilitator of consumer interaction in the metaverse. It plays a central role in fostering online sociality, connecting individuals and building social groups [13]. Furthermore, Frank et al. [14] argue that the digital persona (i.e., digital doppelgänger) exemplifies environmental fidelity, a critical factor in shaping consumer experience in the metaverse. Thus, sociability, immersiveness, and environmental fidelity emerge as primary factors influencing consumer experience in the metaverse [10]. As documented by Mansoor et al. [15], the consumer experience significantly impacts consumer behavior, including their continued intention to use the metaverse. This relationship between digital experience and continued engagement in the metaverse forms the central focus of this study.

Despite growing scholarly interest, few studies have explored the interplay between metaverse characteristics, consumer experience, and consumer behavior—particularly continuance intention in the metaverse [15,16]. Habil et al. [17] examined the influence of augmented reality (AR) characteristics—such as personalization, spatial presence, entertainment, informativeness and interactivity—on consumer experience. In their conceptual work, Buhalis et al. [18] positioned the metaverse as a key driver of consumer experience and value co-creation.-Dwivedi et al. [19] outlined the challenges and opportunities associated with the metaverse, while Koohang et al. [20] focused on emerging business operations and opportunities in this virtual world. Despite these advancements, there remains a lack of empirical evidence on how specific metaverse characteristics—such as sociability, immersiveness, and environment fidelity—influence consumer experience and behavior in the metaverse. To address this gap, the present study investigates the influence of these characteristics on consumer behavior (e.g., continuance intention), examining the mediating role of consumer experience through the lens of experience-dominant (Ex-D) logic. This study makes a pioneering contribution to the metaverse literature by empirically validating the key drivers of consumer experience and their influence on behavioral outcomes. Accordingly, this study addresses the following research question:

> *How does the interplay between metaverse characteristics (sociability, immersiveness, and environmental fidelity) influence consumer experience and their continuance intention to use the metaverse?*

The remainder of this paper is organized as follows: First, we review the literature on experience-dominant (Ex-D) logic and metaverse characteristics, followed by a detailed explanation of our methodology. We then present the findings and discussion, outline theoretical and managerial implications, and conclude by highlighting the study's limitations and directions for future research.

2. Theoretical Background

2.1. Experience-Dominant Logic

This study draws on experience-dominant (Ex-D) logic to explain how various characteristics of the metaverse influence consumer experience and behavior. Ex-D logic posits that value is co-created through interactions between consumers and objects, and this value is subsequently transformed into consumer experience [21]. Khan et al. [4] describe how consumer interactions with digital objects—such as brands—are embodied through digital doppelgängers, which represent the consumer's self-experience in the metaverse [22]. For example, consumers may customize their digital doppelgängers to participate in a metaverse fashion show. These interactions with digital objects (e.g., brands and peers) initiate immersive experiences through the embodied digital self [23]. The digital doppelgänger serves as a humanized extension of the consumer's self, interacting with digital environments and resources on behalf of the physical individual [4]. Zhang et al. [24] emphasize that high-quality interactions with such interactive resources are essential for value creation and identify them as key factors driving consumer engagement on metaverse platforms.

The key interactive resources that shape consumer experience in the metaverse have been identified as sociability, immersiveness and environmental fidelity [10]. Among these, sociability plays a central role in facilitating experience co-creation, which in turn influences consumer participation and behavior in virtual communities [25]. Wongkitrungrueng and Suprawan [26] highlight that the design of virtual environments—including the use of digital personas (i.e., digital doppelgänger)—enhances consumer interaction and fosters immersion [27]. Immersion is defined as a technological property that produces a realistic experience, effectively placing the consumer within an assimilated environment [28]. Buhalis et al. [18] argue that interactions among consumers, virtual objects, and peers simulate virtual and physical experiences, identifying these interactions as key drivers of value creation. A fundamental tenet of Ex-D logic is that value is co-created through interactions with digital objects and environments [29], which evoke meaningful experiences that ultimately influence consumer behavior in the metaverse [21]. This growing body of literature suggests that consumer interactions with digital actors in immersive virtual environments lead to increased immersion, which is then transformed into consumer experience. Therefore, drawing on Ex-D logic, this study introduces sociability, immersiveness, and environmental fidelity as key metaverse characteristics that drive the consumer's experience and behavior in the metaverse.

2.2. What Is the Metaverse?

The concept of the metaverse originated from Neal Stephenson's 1992 novel *Snow Crash*, where it was described as a persistent virtual world in which consumers interact synchronously through their digital personas [19]. Since then, the term "metaverse" has gained significant attention across industry and academia [30]. However, a universally accepted definition of the metaverse remains elusive, reflecting the multifaceted nature of the concept. Jung et al. [31] define the metaverse as a persistent and immersive virtual environment, where consumers engage in economic and social activities creatively and collaboratively using their digital identity. Ritala et al. [32] argue that the metaverse is not merely a virtual environment but a hybrid of virtual and physical worlds. Hennig-

Thurau et al. [12] describe it as a computer-generated space where consumers interact in real time via their digital identities, often referred to as digital doppelgängers [4]. Pal and Arpnikanondt [33] further clarify this by defining the metaverse as a virtual world where consumers perform activities [in the same manner as] a real life.

Despite definitional differences, common elements emerge across conceptualizations. Drawing on these shared elements, we define the metaverse as "*a new digital bailiwick in which consumers live a digital life*". This perspective emphasizes not only the virtual nature of the metaverse but also its replication of real-world consumer activities and social relationships [19]. The extant literature positions the metaverse as a social space that supports a wide range of consumer activities—from work and meetings to entertainment, collaboration, and personal expression [34]. Consequently, major retail brands such as Nike and Gucci invest in the metaverse to enhance consumer experience and build relationships.

Scholars have identified several key characteristics that distinguish the metaverse. First, the metaverse must offer realism, allowing users to feel fully immersed in the virtual environment [35]. Users often describe the experience as being within the Internet rather than merely accessing it [36]. Technologies such as AR, VR, and 3D graphics are central to creating this immersive experience [10]. Second, the metaverse provides virtual spaces for social interaction, enabling users to communicate, collaborate, and engage in shared activities, thereby enhancing sociability through various social experiences [37]. It addresses the limitations of the physical world by allowing consumers to seamlessly interact, communicate, and carry digital assets—such as their digital doppelgänger and possessions—across multiple platforms [27]. Finally, the metaverse offers a rich virtual atmosphere, characterized by 3D scans, organized merchandise, tactile visuals, vibrant environments, and real-time interactions through digital personas [38]. This reflects both the digital representation of consumers (i.e., digital doppelgänger) and the fidelity of their surroundings, referred to as environmental fidelity [10]. Notably, the key characteristics of the metaverse—sociability, immersiveness, and environmental fidelity—are central to shaping consumer experience and behavioral intention, forming the foundation of this study.

As of 2025, the rapid intensification of the metaverse across various industries has significantly expanded its potential and marketing implications [39]. However, the extant literature has primarily focused on its evaluation, usages, theoretical foundations, and conceptualization [40,41]. While some scholars have adopted a multi-dimensional lens to explore the transformational impact of the metaverse [19], there remains a lack of empirical evidence confirming the contribution of these characteristics to consumer experience and behavior—a gaps this study aims to address.

2.3. Metaverse Characteristics

2.3.1. Sociability

The term "sociability" originates from the Latin word "*socius*", meaning comrade or friend. Simmel [11] defines sociability as the human motivation, skills, and desire to communicate and form relationships for non-utilitarian purposes. Zhang et al. [42] further describe it as an individual's tendency to communicate and build relationships, particularly with strangers. In the context of the metaverse, sociability refers to consumers' social interactions in digital spaces through their digital personas [43]. Social interaction is a fundamental human desire, often expressed through leisure activities and the use of technology to extend social connections and enhance interpersonal experiences [44]. The metaverse, as a social platform, enables real-time, multisensory interactions—incorporating touch, sight, and sound—between users [12]. Mark Zuckerberg has even referred to the metaverse as *the holy grail of social interactions* [45].

Inmor et al. [46] underline that social interaction plays a central role in shaping and enhancing consumer experience in virtual settings, which in turn influences future behavioral intentions [47]. Consumer experience in the metaverse is shaped by interactions with various digital actors, allowing consumers to build meaningful social connections [34]. Junglas et al. [48] argue that virtual environments enhance sociability by leveraging technology to facilitate these connections. Consumers often create digital identities (i.e., digital doppelgängers) to engage in activities and form relationships, sometimes even more effectively than in real-life [2]. For instance, CNN reported that over 6000 participants worldwide attended the virtual wedding of Padmavathi and Janaganandhini, illustrating how the metaverse enables individuals to immerse themselves in digital personas and forge meaningful connections [49]. These advancements highlight the growing importance of sociability in shaping consumer experience in the metaverse.

2.3.2. Immersiveness

Immersiveness refers to the degree of immersion experienced during interactions with digital objects in the metaverse [10]. This immersive experience is influenced by digital interactive technologies, the duration of consumer engagement, and the depth of their involvement in the virtual environment. Such involvement leads to a state in which consumers become fully absorbed in their digital identity (i.e., digital doppelgänger), often losing awareness of their physical surroundings [50]. Technologies such as AR and VR facilitate immersive experiences, creating new opportunities across various domains. For example, in Movistar City, consumers interact with like-minded individuals to explore products and services, illustrating how metaverse activities can guide consumer interactions toward deeper immersion [51,52].

Immersion is closely tied to the sense of presence, which is driven by sensory stimuli [53] and psychological engagement rather than physical movement [54]. Sensory inputs—such as touch, sight, and hearing—enrich the immersive experience [55,56]. Importantly, immersiveness also requires a psychological effort from consumers and evolves dynamically over time, distinguishing it from simpler constructs such as flow [50]. Understanding immersiveness as a form of psychological engagement and absorption in the metaverse is therefore critical. This study seeks to explore its impact on consumer experience, an area that remains underdeveloped in the current literature.

2.3.3. Environmental Fidelity

Environmental fidelity refers to the quality of the realism in thevirtual environment, including the digital personas (i.e., digital doppelgänger) and their surroundings in the metaverse [10]. Frank et al. [14] further explain this concept as the alignment between consumer experiences and the visual and sensory quality of the metaverse atmosphere, mirroring real-world environments. In this study, environmental fidelity is defined as "*the metaverse atmosphere—including design, ambiance, and social interaction—that imitates real-world functionality and physicality*". The metaverse atmosphere is composed of three key elements. First is design, which includes visual components such as layout and imagery; second is ambiance, which encompasses environmental features like lighting, color, and music; and third is social interaction, which involves communication between digital identities (i.e., digital doppelgänger) and other users [57,58].

The combinations of these elements create a high-fidelity virtual environment that enhances consumer experience and influences their behavior [26]. The existing literature acknowledges that consumers engage in the metaverse for various purposes including socialization, shopping, and entertainment [59]. A defining feature of environmental fidelity is the ability for consumers to interact synchronously through humanized digital

representations in immersive virtual spaces [8]. These realistic interactions strengthen consumers' sense of presence and emotional engagement, offering immersive experiences that closely resemble real-life settings [14]. Thus, environmental fidelity captures the dynamic interplay between digital doppelgängers and their virtual surroundings, shaping consumer experience and behavior in the metaverse. By fostering immersive and emotionally resonant interactions, it plays a critical role in defining consumer behavior in this emerging digital world.

2.4. Consumer Experience in the Metaverse

Consumer experience refers to a multi-dimensional psychological response to interactions with digital actors throughout a consumer's journey in the metaverse [12]. It emerges as a significant construct in marketing, emphasizing the creation of distinctive, memorable, and emotionally resonant experiences [60]. According to Gahler et al. [61], consumer experience in online and offline marketing contexts encompasses six dimensions: affective, cognitive, physical, relational, sensorial, and symbolic. Suh [62] posits that consumer experience in the metaverse is primarily shaped by cognitive and emotional responses. The cognitive, relational, affective, and sensorial dimensions are grounded in the physical body, framing experiences through sensations and personification. In contrast, the symbolic dimension operates independently of the physical self, allowing consumers to construct meaning through digital representations.

Thus, consumers cognitively engage with and emotionally experience the metaverse through interactions with digital environments and actors [62]. For example, Traci and Dave Gagnon, the first couple to marry in the metaverse, celebrated their marriage through separate digital representations (i.e., digital doppelgängers). Conversely, a reported incident involving a male and female user in a metaverse city highlighted the potential for psychological and emotional harm resulting from negative virtual interactions [63]. Buhalis et al. [18] describe the metaverse as a distinctive, surreal, and co-creative environment, enabling consumers to interact with multiple digital actors—such as brands—within a unique virtual atmosphere. Recent research [10] suggests that key characteristics of the metaverse—immersiveness, sociability, and environmental fidelity—significantly contribute to shaping consumer experience. However, despite growing theoretical interest, empirical evidence validating the influence of these characteristics on consumer experience remains limited. Addressing this gap is a central objective of this study.

2.5. Continuance Intention to Use the Metaverse

The rapid advancement of technology, accelerated by the emergence of the metaverse, has prompted scholars and practitioners to explore virtual environments and their implications for user engagement [64]. The widespread adoption of the metaverse has further amplified opportunities for social connections within immersive virtual spaces. The metaverse enables users to explore virtual environments through immersive interactions with digital actors and other participants, fostering a heightened sense of presence [65]. A variety of co-created activities, such as virtual weddings, fashion shows, and music concerts, among others, facilitate real-time consumer engagement and consumption during immersive experiences [66].

As a result, the number of metaverse users has grown significantly, with many individuals seeking entertainment, escapism, and relief from the complexities of physical life, as virtual spaces offer a sense of freedom, creativity, and relaxation [33]. According to Satista [67], the number of metaverse users is projected to reach 2.6 billion by 2030. Thistrend highlights the increasing relevance of continuance intention—defined as consumers' sustained willingness to engage with the metaverse over time. Understanding

the factors that drive this intention is essential for academic advancement and practical application, and forms the central focus of this study.

3. Conceptualization

3.1. Sociability and Consumer Experience

Oh et al. [5] describe the metaverse as a social platform where a large number of consumers interact in a virtual space through their digital identities, governed by unique social mechanisms. These mechanisms relate to consumers' enthusiasm and their ability to engage in social interactions with digital actors, thereby forming meaningful social connections [68]. Consumers often create digital identities (i.e., digital doppelgängers) to explore the metaverse and fulfill their social needs, which drives consumer participation in virtual activities and enhances their experience [15]. As such, sociability emerges as a critical factor in the metaverse, playing a central role in shaping how consumers experience these virtual environments [48]. Therefore, we propose the following:

H1. *Sociability influences consumer experience in the metaverse.*

3.2. Immersiveness and Consumer Experience

Technological advancements continue to streamline consumer interactions and enhance consumer experiences in the metaverse [27]. Yoo et al. [69] argue that the metaverse leverages advanced immersion to reduce the perception of technological mediation, allowing consumers to interact seamlessly with each other via digital identities. This creates opportunities for immersive experiences that go beyond the limitations of the physical world. The immersive nature of the metaverse fully engages consumers, fostering a sense of involvement in metaverse activities [70]. When consumers are deeply engaged, they often lose awareness of their physical surroundings, entering a state of immersion [71]. The degree of immersion experienced during these interactions is referred to as immersiveness [10]. Previous studies have consistently identified immersion as a vital component of consumer experience in the metaverse [70]. Based on this understanding, we propose the following:

H2. *Immersiveness influences consumer experience in the metaverse.*

3.3. Environmental Fidelity and Consumer Experience

Environmental fidelity is considered as a key determinant of consumer experience in the metaverse [14]. It reflects the extent to which consumers perceive the virtual environment as realistic, engaging, and emotionally resonant. Consumer interactions in the metaverse depend not only on digital actors but also on the quality and authenticity of their surroundings [69]. The metaverse environment incorporates various visual elements (e.g., image, architecture, and layout), atmospheric conditions (e.g., lighting, color, and music), and social components that enable interactions with like-minded individuals [26]. Prior studies have emphasized that environmental fidelity captures the relationship between the virtual quality of the metaverse environment and consumer experience [14]. Barrera and Shah [10] further asserted that environmental fidelity significantly contributes to shaping consumer experience in the metaverse. Hence, we propose the following:

H3. *Environmental fidelity influences consumer experience in the metaverse.*

3.4. Consumer Experience and Continuance Intention

Building upon Ex-D logic, this research highlights the value created during consumer interactions with digital actors and others participants in the metaverse. Cheng [72] describes the metaverse as a fully immersive and interactive virtual world. These immersive

interactions empower consumers to engage in diverse activities [2]. For instance, consumers driving Hyundai cars on Roblox illustrate how digital interactions create unique experiences. Existing studies demonstrate a significant relationship between a consumer's experience and their behavioral intention to use the metaverse [15]. Cognitive assimilation during metaverse use evokes positive emotions, which in turn increases metaverse usage [73]. Furthermore, the presence of multiple synchronous activities enhances user satisfaction and emotional engagement with the platform [74]. These interactions create a co-creative mechanism for experiences that foster platform usage [75]. Hence, we hypothesize the following:

H4. *Consumer experience influences continuance intention to use the metaverse.*

3.5. Mediating Role of Consumer Experience

Consumer experience in the digital environment is a central construct in experiential marketing [76]. With the rise of new digital spaces, consumers increasingly interact with digital objects and environments, shaping their experiences in novel ways [2]. The metaverse, in particular, has emerged as a transformative platform for consumer experience, enabling consumers to engage in immersive digital experiences [12]. For example, consumers craft their digital doppelgänger to interact with brands during virtual activities [4]. This consumer experience mediates the relationship between digital self-representation (i.e., digital doppelgänger) and consumer behavior in the metaverse [77]. Prior research has established a significant relationship between metaverse interactions, consumer experience, and behavioral outcomes [15]. Chen et al. [78] further argue that consumer experience serves as a bridge between metaverse interactions and consumer behavior. This study emphasizes the value created through consumer interactions with digital actors and environments, which is transformed into consumer experience. Accordingly, we conceptualize consumer experience as a mediator between metaverse characteristics—sociability, immersiveness, and environmental fidelity—and consumer behavior (i.e., continuance intention) in the metaverse.

The metaverse has increasingly become an integral part of daily life, particularly in fostering sociability [79]. Sociability is recognized as a key factor influencing consumer experience and behavior in the metaverse [5]. Tombul and Sari [7] emphasize sociability as a fundamental human desire to connect and fulfill social needs, which drives consumer participation in metaverse environments. Consequently, consumers often create digital identities (i.e., digital doppelgängers) to engage in social activities in the metaverse [12].

The consumer experience encompasses sensory–motor interactions that integrate various bodily sensations and align them with the consumer's multimodal neural networks [80]. These interactions with digital actors and virtual environments create value, which is transformed into meaningful experiences [21]. Prior studies have shown that consumer experience mediates the influence of consumer interactions with peers on behavioral outcomes [81]. Therefore, we propose the following:

H5. *Consumer experience mediates the influence of sociability on continuance intention to use the metaverse.*

In the metaverse, immersiveness refers to the depth of consumer involvement and psychological engagement in virtual activities [82]. Barrera and Shah [10] identify immersiveness as a key dimension of consumer experience, shaped by technological factors and a sense of embodiment [4] fostering an immersive experience. Flavián et al. [55] posit that an immersive virtual experience is positively associated with consumer behavior in virtual environments [83]. Immersiveness, therefore, fosters behavioral responses by

deeply engaging consumers in interactive experiences. Previous research has validated the mediating role of immersive experience between embodiment and consumer behavior [71]. Accordingly, we propose the following:

H6. *Consumer experience mediates the influence of immersiveness on continuance intention to use the metaverse.*

Furthermore, evidence suggests a relationship between environmental fidelity, consumer experience, and behavioral outcomes in the metaverse [14]. Rahman et al. [84] argue that consumers often participate in metaverse activities from comfortable settings such as homes or offices, which enhances their overall experience and behavioral responses (e.g., loyalty). High-fidelity virtual environments—characterized by organized merchandise, detailed visualizations, and realistic graphics—enhance sensory engagement and foster positive behavioral outcomes [85,86]. Fidelity thus plays a crucial role in shaping the consumer's experience and behavior through realistic digital representations (i.e., digital doppelgängers) and their surroundings [10,43]. Hence, we propose the following:

H7. *Consumer experience mediates the influence of environmental fidelity on continuance intention to use the metaverse.*

4. Methodology

4.1. Study 1

Delphi Study

The Delphi method is a well-established qualitative research approach, particularly useful when the existing literature does not provide a clear understanding of a specific issue [87,88]. It offers a systematic, multi-phase process for collecting expert opinions on complex topics through a series of questionnaires supplemented by controlled feedback [89]. In the context of this study, several scholars have argued that the metaverse's characteristics significantly contribute to consumer experience and behavioral outcomes in the metaverse. For example, Barrera and Shah [10] suggest that sociability, immersiveness, and environmental fidelity are lever to design consumer experiences, and ultimately influence behavioral outcomes in the metaverse [15]. To identify and validate the relevant criteria associated with these characteristics, we conducted a modified Delphi survey to gather expert opinions on the critical factors influencing consumer experience and behavior in the metaverse.

The modified Delphi method involved three main stages: (i) conducting a literature review to compile a list of relevant constructs, (ii) selecting a panel of experts, and (iii) administering two rounds of anonymous surveys to achieve a consensus among the participating experts [90]. Based on the literature review, we developed a list of factors considered significant in shaping consumer experience and behavior in the metaverse (see Table 1). We then selected 26 experts, divided into two panels. Panel A consisted of 14 participants with academic backgrounds in metaverse research and active publication records. Panel B included 12 participants with practical experience using metaverse platforms [91]. Demographic details of the experts are provided in Appendix A.

The data was collected using an online Qualtrics survey, which included the listed factors and their descriptions. Respondents evaluated the significance of each factor in influencing consumer experience and behavior using a 7-point Likert scale (1: not important at all; 7: extremely important). The survey was distributed via email between June and July 2024. To determine a consensus, we adopted the following standard Delphi criteria [90]: (1)the mean ratings for each factor must exceed 5; (2) at least 75% of respondents must rate

the factor as 5 or above; and (3)the standard deviation must be below 1.5. The results from the initial round met all the Delphi criteria (see Table 2).

Table 1. Key characteristic relating to consumer experience.

Variables	Description
Sociability	A tendency to form relationships for non-utilitarian purposes in the metaverse [43].
Immersiveness	The degree of immersion experienced during interactions with digital actors in the metaverse [10].
Environmental fidelity	The virtual environment's quality, including digital personas (i.e., digital doppelgängers) and their surroundings in the metaverse [10].

Table 2. Delphi study results.

Variables	Mean		Standard Deviation		Agreement on 75%	
Panel	A	B	A	B	A	B
Sociability	6.36	6.33	0.84	0.89	92.86%	91.67%
Immersiveness	5.93	5.83	0.83	1.19	78.57%	75.00%
Environmental fidelity	6.14	5.92	0.86	1.00	85.71%	83.33%

Following the confirmation of the first round results, a second round of the Delphi survey was conducted. Experts were presented with the ranked factors along with their means, medians, and standard deviations. They were asked whether they agreed with their previous ratings or wished to revise their evaluations, with the option to provide additional comments. In the second round, 92% of metaverse researchers (panel A) and 83% of metaverse users (panel B) indicated satisfaction with their initial ratings. These findings confirmed the consensus based on the standard criterion of 75%, thereby validating that sociability, immersiveness, and environmental fidelity are significant factors influencing consumer experience and behavior in the metaverse. Following this confirmation, these validated factors were incorporated in study 2 to examine their influence on continuance intention to use the metaverse, with consumer experience as a mediating variable (see Figure 1).

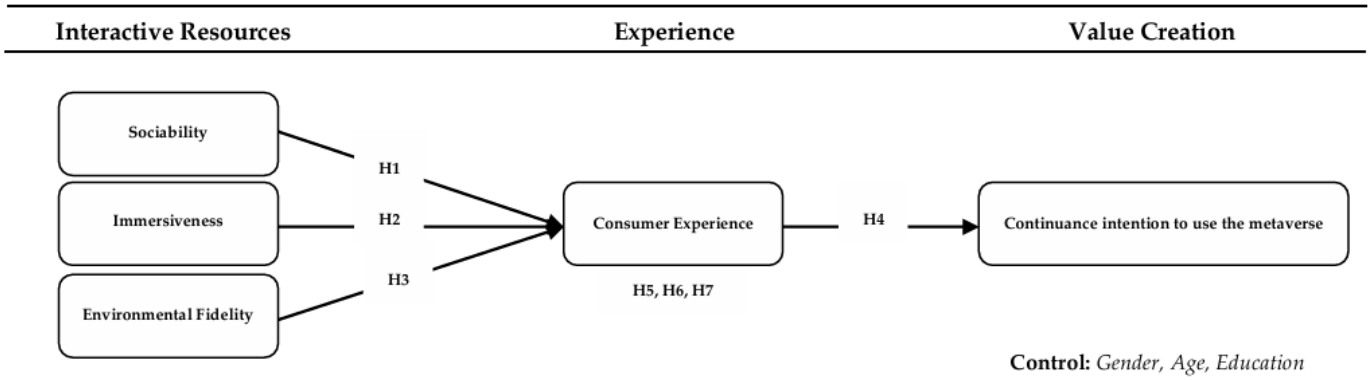

Figure 1. Conceptual framework.

4.2. Study 2

4.2.1. Construct Measurements

The measurement scales were adapted from the established literature and modified to fit the context of this research. Specifically, items were drawn from the following sources: immersiveness [92], sociability [93], environmental fidelity [57,94], consumer experience [61], and continuance intention [15]. To ensure data quality, two screening

questions were included in the survey: *(1) Are you familiar with the metaverse? (2) How long have you been using the metaverse?* The questionnaire was reviewed by a panel of four experts—two marketing professors and two senior doctoral researchers—to assess its clarity and readability. Participant confidentiality was emphasized, and the study's objectives were not disclosed to minimize demand artifact bias [95].

Demographic variables such as gender, age, and education were included as control variables, as these have been shown to influence consumer behavior in both virtual and physical environments [15,96]. Including these variables enhances the accuracy and generalizability of the study's findings.

4.2.2. Technique for Analysis

This study employed partial least squares structural equation modeling(PLS-SEM) for data analysis [97]. PLS-SEM is particularly well-suited for exploratory research and technology-related models [98], and it does not require strict sample size requirements [99]. Prior studies in the metaverse domain have used PLS-SEM [83]. Legate et al. [100] argue that PLS-SEM overcomes limitations associated with covariance-based structural equation modeling.

In addition to PLS-SEM, this study employed Necessary Condition Analysis (NCA) to identify the necessary conditions for continuance intention and Importance Performance Analysis (IMPA) to determine the most influential drivers of the continuance intention to use the metaverse. Furthermore, PLS-Predict was employed to assess the predictive ability of the research model [101]. To ensure a comprehensive evaluation of the data, the following additional statistical tools were used: G-power was used to determine the appropriate sample size, and SPSS 23 was employed for conducting a paired-t-test and factor analysis.

4.2.3. Data Collection

The data were collected via an online Qualtrics survey (in English) and distributed across metaverse-related Facebook communities. The data collection took place in Pakistan from August to October 2024 due to limited insights about the metaverse from emerging markets. A criterion-based judgment sampling technique was employed due to limited accessibility to qualified respondents. Pakistan is witnessing a dramatic rise in the adoption of the metaverse, with its market value estimated to reach USD 1.7 billion by 2030 [102], yet there are limited scholarly insights from emerging markets on technology-related initiatives [103]. A total of 391 valid responses were retained after removing 59 incomplete or invalid responses, resulting in an 86.89% response rate (see Table 3). A G-power analysis indicated that a minimum of 129 responses was required at significance level of0.05 with an effect size (f^2) of 0.15 [104]. In line with Armstrong and Overton [105], the non-response bias was assessed using a paired-t-test between the first 50 and last 50 responses. No significant differences were found, indicating that non-response bias was not a concern (see Appendix B).

Table 3. Participant profiles (n = 391).

Characteristics	Categories	Frequency	Percentage
Gender	Male	196	50.1
	Female	175	44.8
	Prefer not to say	20	5.1
Age (years)	18–24	122	31.2
	25–34	150	38.4
	35–44	74	18.9
	45–above	45	11.5

Table 3. *Cont.*

Characteristics	Categories	Frequency	Percentage
Education	High School	13	3.3
	Undergraduate	82	21.0
	Graduate	191	48.8
	Postgraduate	105	26.9
Metaverse platform most recently used	Fortnite	64	16.4
	Roblox	106	27.1
	ZEPETO	108	27.6
	NVIDIA	61	15.6
	Other	52	13.3
Visit purpose	Playing games	52	13.3
	Socializing or meeting friends	98	25.0
	Creating content/virtual products/world	145	37.1
	Other	96	24.6
Metaverse experience length	Less than 1 month	150	38.4
	1–3 months	142	36.3
	4–6 months	49	12.5
	7–12 months	50	12.8

4.2.4. Measurement Model

The measurement model was evaluated using factor loadings (λ), average variance extracted (AVE), composite reliability (CR), and Cronbach's alpha (α), following the guidelines of Hair et al. [97]. The standard thresholds for an acceptable measurement quality are the following: factor loading ≥ 0.70; AVE ≥ 0.50; CR ≥ 0.70; and Cronbach's alpha ≥ 0.70 [97]. All constructs exceeded these thresholds, confirming the reliability and validity of the measurement model (see Table 4).

Table 4. Reliability and validities.

Measurement	λ	VIF
Sociability (α = 0.890, CR = 0.924, AVE = 0.753)		
I like to be with other people in the metaverse	0.830	2.027
I welcome opportunities to mix socially with people in the metaverse	0.902	3.014
I prefer working with others rather than alone in the metaverse	0.864	2.478
I would be unhappy if I were prevented from making many social contracts in the metaverse	0.873	2.414
Immersiveness (α = 0.796, CR = 0.868, AVE = 0.622)		
The metaverse world suddenly disappeared at the end of the experience	0.760	1.499
During the metaverse experience, my body was in the real world, but my mind was in the metaverse	0.847	1.964
The metaverse experience made me forget the realities of the outside world	0.791	1.689
During the metaverse experience, I lost awareness of my surroundings	0.752	1.446
Environmental Fidelity (α = 0.919, CR = 0.939, AVE = 0.754)		
I feel happy to see attractive displays in 3D in the metaverse	0.851	2.519
I enjoy the organized merchandise in the metaverse	0.860	2.753
I feel relaxed listening to the music in the metaverse	0.877	2.952
I feel comfortable with the colorful pictures in the metaverse	0.886	2.969
Friendly interactions with others enhance my interest in the metaverse	0.868	2.690

Table 4. *Cont.*

Measurement	λ	VIF
Consumer Experience (α = 0.862, CR = 0.897, AVE = 0.593)		
My interactions with others in the metaverse positively engage my senses in a variety of ways	0.721	1.679
My interactions with others in the metaverse stimulate positive emotions	0.729	1.671
I feel positively associated with others in the metaverse	0.760	1.780
My personal beliefs are confirmed during my interactions with others in the metaverse	0.763	1.736
I find positive insights during my interactions with others in the metaverse	0.841	2.587
I feel like I can move in a way that I like in the metaverse	0.801	2.252
Continuance Intention (α = 0.826, CR = 0.896, AVE = 0.742)		
I intend to use the metaverse again	0.861	1.840
I would consider continuing my use of the metaverse	0.862	1.935
I intend to use the metaverse in the future	0.860	1.852

Note: λ: Factor loading; α: Cronbach's alpha; CR: composite reliability; AVE: average variance extracted.

As shown in Table 5, discriminant validity was established using two approaches: the heterotrait–monotrait (HTMT) ratio, with all values below the recommended threshold of 0.90 [106], and the Fornell–Larcker criterion, where the square root of the AVE for each construct exceeded its correlations with the other constructs [107]. Common method bias was assessed using Harman's test in SPSS, which revealed that a single factor accounted for 41.67% of the variance, well below the standard values of 50%, indicating no significant common method bias [108]. Multicollinearity was also examined, with all VIF values below 3.3 (see Table 4), confirming the absence of multicollinearity issues [109].

Table 5. Discriminant validities.

	1	2	3	4	5
HTMT Criterion					
1. Consumer Experience					
2. Environmental Fidelity	0.494				
3. Immersiveness	0.858	0.355			
4. Sociability	0.872	0.397	0.807		
5. Continuance Intention	0.820	0.400	0.689	0.806	
Fornell and Larcker Criterion					
1. Consumer Experience	***0.770***				
2. Environmental Fidelity	0.443	***0.868***			
3. Immersiveness	0.712	0.304	***0.788***		
4. Sociability	0.768	0.361	0.681	***0.867***	
5. Continuance Intention	0.699	0.349	0.559	0.693	***0.861***

Note: The diagonal entries (in bold) represent the square root of the AVE; the off-diagonal entries represent the correlations between constructs.

4.2.5. Predictive Ability

The model's predictive ability was assessed using the coefficient of determination (R^2), predictive relevance (Q^2), and effect size of the coefficient (f^2), following the guidelines of Sarstedt et al. [110]. According to Cohen [111], R^2 values of 0.75, 0.50, and 0.25 are interpreted as substantial, moderate, and weak, respectively. Similarly, Q^2 values of 0.35, 0.15, and 0.02 indicate significant, medium, and small predictive relevance. The f^2 indixes are interpreted as 0.02 (low), 0.25 (average), and 0.35 (strong). Model fit was further evaluated using indices such as SRMR, d_ULS, d_G, and NFI, all of which met the recommended thresholds [99]. The goodness of fit (GoF) index exceeded the minimum threshold of 0.36, indicating an acceptable model fit [112]. All values confirmed the model's predictive strength and fitness (see Table 6).

Table 6. Predictive ability.

	1	2	3	4	5	Model Indices
R^2				0.681	0.550	
Q^2				0.673	0.492	
f^2						
1. Sociability				0.370	0.114	
2. Immersiveness				0.186	0.001	
3. Environmental Fidelity				0.076	0.003	
4. Consumer Experience					0.102	
5. Continuance Intention						
SRMR						0.052
d_ULS						0.690
d_G						0.352
NFI						0.860
GoF						0.653

SRMR: Standardized Root Mean Squared Residual; NFI: Normed Fit Index; GoF: goodness of fit.

4.2.6. Structural Model Results

Following the validation of the measurement model, the structural model was evaluated using PLS-SEM in SmartPLS4 [97]. As shown in Table 7, all direct hypotheses were supported:

- Sociability significantly influences consumer experience in the metaverse (β = 0.481), supporting H1.
- Immersiveness significantly influences consumer experience in the metaverse (β = 0.334), supporting H2.
- Environmental fidelity significantly influences consumer experience in the metaverse (β = 0.167), supporting H3.
- Consumer experience significantly influences continuance intention to use the metaverse (β = 0.379), supporting H4.

Table 7. Hypothesis testing.

Direct Effects	β	*t*-Values	f^2	*p*-Values
H1. SA→CE	0.481	9.737	0.193	0.000
H2. IM→CE	0.334	6.778	0.103	0.000
H3. EF→CE	0.167	5.372	0.066	0.000
H4. CE→CI	0.379	5.900	0.079	0.000
Gender→CI	0.035	1.068	0.000	0.286
Age→CI	0.089	2.437	0.012	0.015
Education→CI	−0.017	0.400	−0.000	0.689
Mediating effects				
H5. SA→CE→CI	0.182	4.780	0.052	0.000
H6. IM→CE→CI	0.126	4.573	0.048	0.000
H7. EF→CE→CI	0.063	4.176	0.040	0.000

Note: SA: Sociability; IM: immersiveness; EF: environmental fidelity; CE: consumer experience; CI: continuance intention; f^2: path effect size.

The mediating role of consumer experience was also confirmed:

- H5: Consumer experience partially mediates the influence of sociability on continuance intention (β = 0.182).
- H6: Consumer experience fully mediates the influence of immersiveness on continuance intention (β = 0.126).

- H7: Consumer experience fully mediates the influence of environmental fidelity on continuance intention (β = 0.063)

The effect size (f^2) of the path was calculated using Hay's estimation, yielding a value of 0.193, indicating a large effect size (see Appendix C).

Regarding the control variables, gender and education were found to be insignificant and did not affect continuance intention. However, age was found to have a significant effect on the continuance intention to use the metaverse (see Table 7).

4.2.7. Importance Performance Analysis

IMPA is a valuable technique for identifying the most influential factors driving outcome variables, such as continuance intention to use the metaverse [113]. Following established research [113], this analysis demonstrates how increases in the values of predictor variables proportionally enhance the performance of the target variable, depending on their relative significance. In this study, immersiveness, sociability, environmental fidelity, and consumer experience were identified as predictors of continuance intention. The results indicate that sociability is the most dominant factor influencing consumer experience and, subsequently, the continuance intention to use the metaverse (see Table 8). This finding suggests that users are primarily motivated to explore virtual possibilities and fulfill their social needs in the metaverse, reflecting a fundamental human desire [11]. The importance performance analysis map is presented in Figure 2.

Table 8. Importance performance analysis.

Constructs	Importance	Performance
Continuance Intention		
Consumer Experience	0.379	68.582
Environmental Fidelity	0.103	71.643
Immersiveness	0.151	65.934
Sociability	0.554	72.445

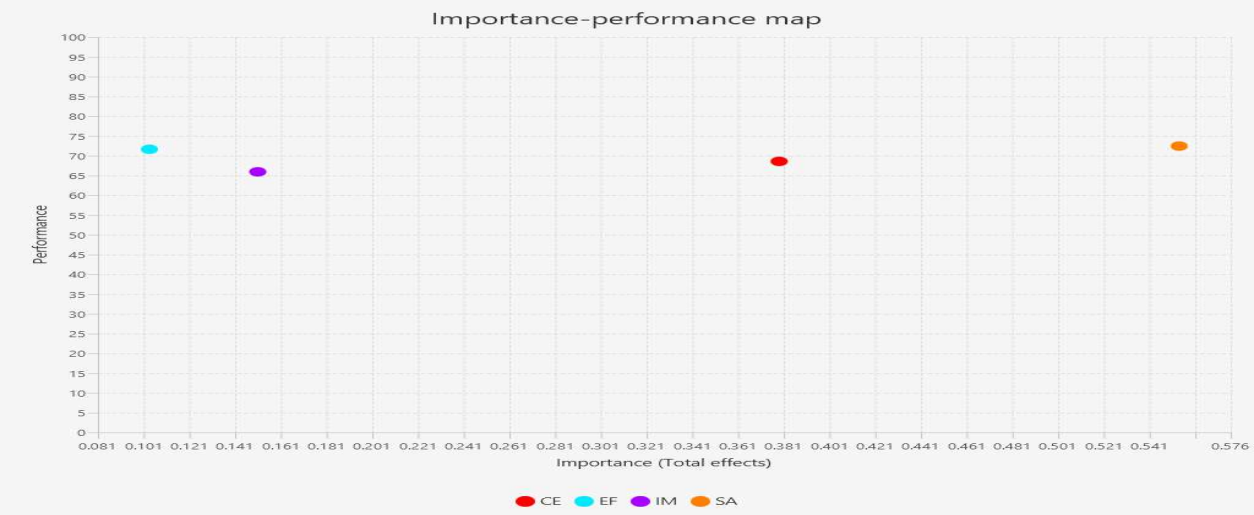

Figure 2. Importance performance analysis map.

4.2.8. Necessary Condition Analysis

NCA is a robust method for identifying conditions that must be present for a desired outcome to occur—in this case, the continuance intention to use the metaverse [114]. The logic behind NCA is that necessary conditions are essential but not sufficient; without them,

the desired outcome cannot be achieved. Pillai et al. [83] argue that combing NCA with SEM provides a more comprehensive understanding of complex phenomena. In this study, NCA was employed to determine the necessary factors for the continuance intention to use the metaverse [115]. The ceiling envelopment with free disposal hull (CE-FDH) approach was used, which "*separates the space with observations from the space without observations*" [116] (p. 685). Scatter plots were generated to visualize the relationships between the predictors and the outcome variable (see Appendix D). According to Dul [117], NCA effect sizes are interpreted as follows: $0 < d < 0.1$, small effect; $0.1 \leq d \leq 0.3$, medium effect; and $0.3 \leq d \leq 0.5$, large effect. Additionally, the *p*-value must be statistically significant to confirm necessity. The findings reveal that consumer experience plays a prominent role as a necessary condition for the continuance intention to use the metaverse. Other factors also contribute to enhancing the experiential quality of the environment, complementing the results from the structural equation modeling (see Tables 9 and 10).

Table 9. NCA effect sizes.

Factor	Continuance Intention	
	CE-FDH Effect Size	*p*-Value
Sociability	0.049	0.010
Immersiveness	0.062	0.002
Environmental Fidelity	0.050	0.388
Consumer Experience	0.158	0.000

Table 10. Bottleneck table.

Continuance Intention	Sociability	Immersiveness	Environmental Fidelity	Consumer Experience
0.00%	NN	NN	NN	NN
10.00%	NN	NN	NN	1.318
20.00%	NN	NN	NN	1.318
30.00%	NN	1.248	NN	1.318
40.00%	NN	1.248	NN	1.318
50.00%	NN	1.248	NN	1.318
60.00%	1.277	1.248	NN	1.318
70.00%	1.277	1.248	NN	1.830
80.00%	1.277	2.025	1.806	2.368
90.00%	1.277	2.025	1.806	2.368
100.00%	2.000	2.281	1.806	2.442

[NN—Not Necessary].

5. Discussion

The metaverse has emerged as a transformative digital landscape, gaining substantial growth across academia and industry [19,27,118]. Grounded in Ex-D logic, this study offers novel insights into how key metaverse characteristics—sociability, immersiveness, and environmental fidelity—influence consumers' continuance intention to use the metaverse, with consumer experience serving as mediating mechanism. The Delphi study confirmed the theoretical significance of these characteristics in shaping consumer experience and behavior. The survey results further revealed that consumer experience partially mediates the influence of sociability on continuance intention, and fully mediates the effects of immersiveness and environmental fidelity [119]. These findings highlight the central role of consumer experience in translating metaverse features into continued user engagement.

Among the three characteristics, sociability emerged as the most influential driver of continuance intention. This aligns with Simmel's [11] view of sociability as an intrinsic human desire for social connection. The metaverse, by enabling real-time, multisensory social engagement, fulfills this need and motivates users to return. In contrast, immersiveness and environmental fidelity contribute more indirectly by enhancing the experiential quality of the metaverse. Immersiveness fosters deep psychological engagement, while environmental fidelity enhances realism and sensory appeal, both essential for creating meaningful and memorable experiences.

This study addresses a critical gap in the literature by empirically validating the mediating role of consumer experience in the relationship between metaverse characteristics and behavioral outcomes. IMPA further identified sociability as the most impactful factor, reinforcing the idea that consumers are primarily driven by the desire to fulfill social needs in virtual spaces. Additionally, NCA revealed that consumer experience is not only influential but essential for continuance intention. Without a meaningful experience, the presence of technological features alone is insufficient to maintain consumer engagement. This finding complements the structural model results and highlights the foundational role of experience in the metaverse ecosystem.

In sum, this study contributes to the growing body of metaverse literature by offering a comprehensive model that integrates metaverse characteristics, consumer experience, and behavioral intentions. It provides theoretical and practical insights for platform designers and marketers seeking to enhance consumer engagement within immersive virtual environments.

5.1. Theoretical Implications

This study advances the theoretical understanding of consumer behavior by conceptualizing metaverse characteristics as key drivers of consumer experience and behavioral outcomes in virtual environments. Our contributions unfold across several dimensions. First, this research extends Ex-D logic [21] to a metaverse context by empirically demonstrating how interactions with digital actors and environments contribute to co-creating consumer experience. While Ex-D logic has traditionally been applied in physical service settings, our findings reveal that metaverse-based interactions generate a unique form of digital experience, where consumer interactions shape their perceptions and behaviors in virtual environments [4]. Second, this study identifies sociability as a critical factor, driven by an intrinsic human desire and directly associated with consumer behavior, supporting the findings of Zhang et al. [42]. These findings reinforce the notion that sociability is an innate human motivation for connection [11], which internally drives consumers to participate in metaverse-based activities. Stronger social interactions not only enhance consumer experience but also positively influence behavioral outcomes. This extends the prior metaverse literature [43] by demonstrating that sociability and environmental fidelity not only facilitate engagement but also enhance immersive consumer experiences and continuance intention. Moreover, this study confirms that high-fidelity digital environments and immersive interactions allow consumers to construct and embody enhanced version of themselves. This reinforces the idea that virtual possessions, digital doppelgängers, and immersive experiences contribute meaningfully to behavioral response in the metaverse.

Third, while previous conceptual studies [10] proposed that sociability, immersiveness, and environmental fidelity were levers to design consumer experiences, our study empirically validates these claims using Delphi expert evaluations and structural equation modeling with metaverse users. Importantly, our findings confirm that consumer experience is a necessary condition for continuance intention, reinforcing the idea that metaverse interactions must foster meaningful engagement to sustain long-term usage. Fourth, the

results show that consumer experience fully mediates the influence of immersiveness and environmental fidelity on continuance intention, suggesting that heightened psychological involvement and environmental realism contribute to emotionally resonant experiences. The partial mediation between sociability and continuance intention suggests the presence of multiple mechanisms, with consumer experience being one of several influential factors. Finally, the application of SEM, IMPA, and NCA enhances this study' s methodological rigor by quantifying the threshold effects of metaverse characteristics on consumer experience and continuance intention [115–117]. These insights provide a nuanced understanding of how different virtual elements contribute to consumer experience and behavioral intention, reinforcing the metaverse as a space where consumers do not merely participate but embody their digital selves [120].

5.2. Managerial Implications

This study provides significant insights for metaverse designers, businesses, and policy makers aiming to foster sustainable and engaging virtual environments. By demonstrating that sociability, immersiveness, and environmental fidelity significantly influence consumer experience and continuance intention, this study highlights the need for strategic interventions that enhance user engagement while ensuring ethical, inclusive, and secure digital spaces. The findings identify sociability as the most influential factor driving consumer engagement, emphasizing that social interaction is a key determinant of continued metaverse participation. Events like the virtual wedding of Padmavathi and Janaganandhini, which attracted over 6000 global attendees, illustrate how shared digital experiences can foster engagement and drive sustained participation. Managers should consider prioritizing community-driven interactions by integrating co-creative activities, interactive group engagements, and AI-driven social matchmaking to strengthen digital social ties. Businesses could facilitate seamless social interactions through intuitive communication tools, real-time engagement features, and personalized virtual spaces that adapt to user preferences. The full mediation effects of immersiveness and environmental fidelity on consumer experience reinforce the importance of creating highly interactive and visually compelling virtual environments. To maximize immersion, managers may consider enhancing doppelgänger customization, integrating spatial audio and haptic feedback, and creating dynamic, adaptive virtual environments that evolve with user interactions. The ability to personalize digital identities and digital spaces strengthens consumer immersion, making the metaverse experience more meaningful. Personalization further enhances this by learning user preferences and adapting content, social interactions, and shopping experiences in real time, fostering a deeper emotional attachment and sustained participation.

6. Conclusions

This study introduces metaverse characteristics as key drivers of consumer experience, offering a framework to understand consumer behavior in virtual environments. By focusing on sociability, immersiveness, and environmental fidelity, this study demonstrates how these three dimensions shape consumer experience and, in turn, influence their continuance intention to use the metaverse. The findings provide strong empirical evidence that these characteristics significantly influence consumer experience and behavior in the metaverse [10]. A notable contribution of this research is the identification of sociability as a fundamental human desire that influences consumer experience and behavioral outcomes, complementing existing research [42] and fulfilling intrinsic social needs [11]. Immersiveness is shown to enhance consumer interaction with digital actors, blending physical and digital elements to create a seamless experience. Environmental

fidelity enriches consumer experience by offering interactive visuals, 3D environments, organized merchandise, and immersive design elements [14], aligning with the concept of metaverse atmospherics [57]. These findings empirically validate calls for research into immersive digital environments [121]. Furthermore, this study contributes to the literature on technological adoption in virtual settings by highlighting metaverse characteristics as significant behavioral drivers [122]. With these findings, this study enhances our understanding of how metaverse characteristics—sociability, immersiveness, and environmental fidelity—collectively shape consumer experience and influence behavioral outcomes such as continuance intention in the metaverse.

7. Limitations and Future Research

While this study offers valuable insights on the metaverse, several limitations provide opportunities for future research. First, this study focuses on the impact of certain metaverse characteristics—sociability, immersiveness, and environmental fidelity—on consumers' continuance intention to use the metaverse. Future research could explore other characteristics, such as interactivity, personalization, and gamification, to develop a more comprehensive understanding of consumer behavior in the metaverse. Second, this study found a partial meditation role of consumer experience between sociability and continuance intention. Future research could investigate these relationships further, possibly by exploring moderating or additional mediating variables that could explain this relationship. Third, the NCA effect size for environmental fidelity was found to be relatively low, warranting further investigation by incorporating additional predictors and examining why certain characteristics may have weaker effects. Fourth, age was found to significantly influence continuance intention. Future research could delve deeper into demographic, cultural, and contextual factors, examining their nuanced effects and interactions with metaverse features. Fifth, this study focused on continuance intentions as the primary outcome variable. Future research could expand this focus to include consumer loyalty, engagement, and purchase behavior to better understand long-term consumer commitment in the metaverse. Sixth, this research was conducted with participants who had prior metaverse experience and was limited to a sample from Pakistan. Future studies could incorporate larger and more diverse samples across various cultural contexts to improve generalizability. Finally, our study employed a survey-based methodology. Future research could adopt experimental or qualitative approaches to provide deeper insights into consumer interactions in the metaverse and validate the proposed framework in different contexts.

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Informed Consent Statement: Informed consent was obtained from all subjects involved in this study.

Data Availability Statement: Data available on reasonable request to the corresponding author due to ethical concerns.

Conflicts of Interest: The authors declare no conflicts of interest.

Appendix A. Expert Profile

	Gender	Age	Job Position	Country
Panel A				
1	Male	56	Professor	UK
2	Male	43	Associate Professor	China
3	Female	29	Doctoral student	Pakistan
4	Male	34	Assistant Professor	India
5	Female	42	Associate Professor	Malaysia
6	Male	31	Doctoral student	China
7	Male	30	Researcher	Finland
8	Female	27	Doctoral student	USA
9	Male	39	Associate Professor	Pakistan
10	Male	36	Lecturer	Malaysia
11	Female	37	Assistant Professor	Pakistan
12	Male	32	Postdoc student	China
13	Male	47	Associate Professor	India
14	Male	35	Lecturer	Pakistan
Panel B	**Gender**	**Age**	**Education**	**Country**
1	Female	27	Master	Pakistan
2	Male	32	Doctoral degree	China
3	Female	29	Master	Fiji
4	Male	27	Graduated	China
5	Male	33	Master	Malaysia
6	Male	28	Doctoral degree	Morocco
7	Female	31	Bachelor	China
8	Female	21	Graduated	Bangladesh
9	Male	23	Graduated	India
10	Male	26	Master	Iran
11	Male	28	Graduated	UK
12	Female	32	Bachelor	Pakistan

Appendix B. Non-Response Bias

Paired Sample Test	Mean	Std. Deviation	t	df	Sig.
Immersiveness	0.61	4.18	1.04	49	0.30
Environmental Fidelity	0.05	5.10	0.07	49	0.94
Sociability	0.88	5.22	1.20	49	0.23
Consumer Experience	0.30	4.79	0.44	49	0.65
Continuance Intention	0.58	2.93	1.41	49	0.16

Appendix C. Hay's Estimation

Hay's Omega Squared measure of effect size

	t	DF	Sum of squares between	Sum of squares total	Mean square of error	degree freedom of SSB	F	k	n
T-test	9.737	390	0.727						
ANOVA		7	9.443	23.844	0.209	2	11.604	6	60

Omega square, t-test =	0.193497102	(just need t and DF)
Omega squared, ANOVA=	0.128371507	

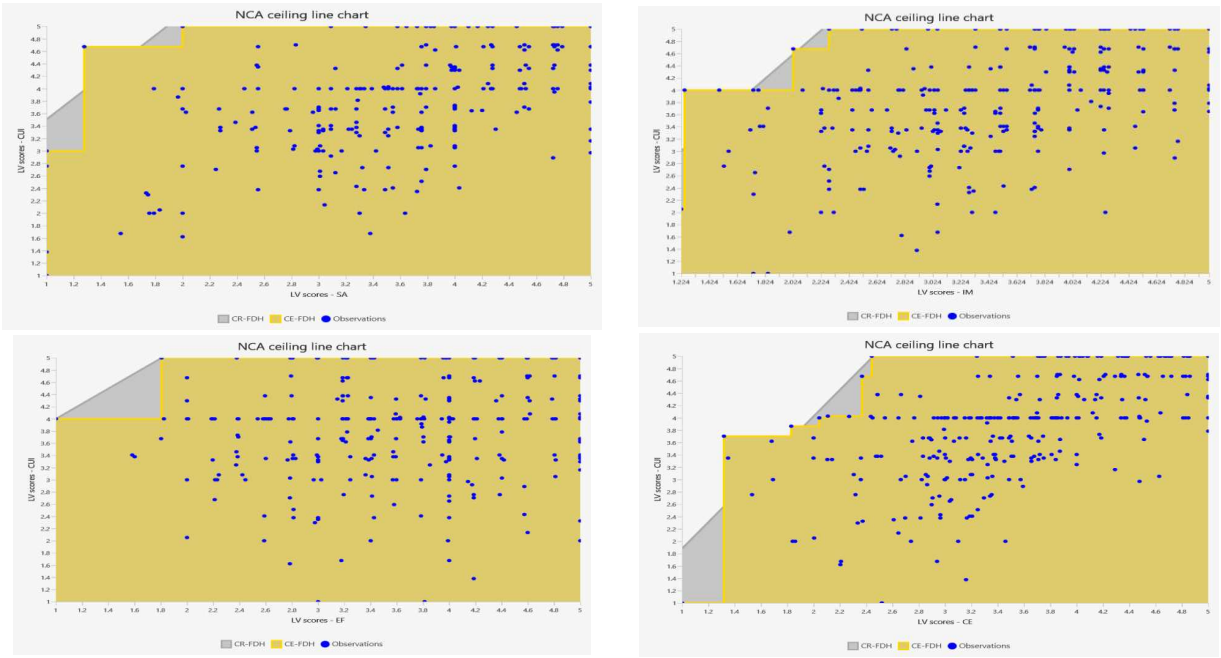
Small ($\omega^2 = 0.01$), medium ($\omega^2 = 0.06$) and large ($\omega^2 = 0.15$) (Cohen's estimates)

Cohen, Jacob (1977). *Statistical Power Analysis for the Behavioral Sciences.* New York: Academic Press.

ANOVA formula $$\omega^2 = \frac{(F-1)*(k-1)}{(F-1)*(k-1)+k*n}$$

Where
F = F-test value
k = number of groups
n = number of respondents per group

Appendix D. NCA Scatter Plots



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