

Purchase spillovers from the metaverse to the real world: The roles of social presence, trialability, and customer experience

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Abstract

The promise of the metaverse as a collective, virtual, and shared social space is revolutionizing digital retail. This study provides groundbreaking insights into customer experience in immersive metaverse environments, as well as into how these experiences on metaverse platforms influence customers' real-world consumption behaviors. Drawing upon data from metaverse platform users in the US, this study identifies the specific antecedents of a positive customer experience on metaverse platforms, including the role of social presence and trialability. Further, it demonstrates the potential for purchase spillovers from the metaverse to traditional retail channels, extending the omnichannel retail literature. In addition, it examines how early-stage versus long-term users of the metaverse shape users' intentions to revisit metaverse platforms. Based on our results, we offer a comprehensive model of customers' metaverse behaviors, which may be used to predict and enhance customers' purchase intentions across channels. Our results also demonstrate that the metaverse is not merely a parallel digital retail channel but instead an influential extension of the customers' real-world consumption. From a managerial perspective, we offer metaverse operators and retail brand managers insights into how an engaging and immersive customer experience in the metaverse can be developed to support metaverse platform growth, and targeted brand strategies that translate into real-world gain for both the brand and the customer. The findings suggest that metaverse platforms must deliver customer experiences at a very high level to prevent stagnation in metaverse usage intentions; therefore, managers can confidently continue investing in relevant strategies to fuel metaverse platform growth.

1 | INTRODUCTION

The metaverse is defined by Hennig-Thurau et al. (2023) as “a new computer-mediated environment consisting of virtual ‘worlds’ in which people act and communicate with each other in real-time via avatars in a multisensory way” (p. 889). Metaverse platforms such as Upland, Roblox, Sandbox, and Decentraland are highly immersive and interactive 3D virtual environments that have been designed to

replicate the physical world (Ibrahim, 2023; Wang, Ning, et al., 2023). These platforms are attracting significant scholarly and commercial attention (Gao et al., 2023; Hadi et al., 2023; Wang, Ning, et al., 2023) because they enable various actors (e.g., metaverse platform operators, customers, and brands) to participate in a diverse range of activities, including games, work, shopping, tourism, conferences, and concerts (Dwivedi et al., 2022; Yoo et al., 2023). Through personalized digital avatars, customers and retailers can create social communities,

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host events, buy and sell digital products, and co-create real-time experiences (Cheng et al., 2022; Ng, 2022). The uniqueness and rapid development of the metaverse is attributable to emerging technologies such as blockchain, non-fungible tokens, artificial intelligence (AI), digital twinning, augmented reality (AR), virtual reality (VR), mixed reality, extended reality, and 5G (Gao et al., 2023; Spais et al., 2023; Wang, Su, et al., 2023). Furthermore, brands' advancements in Web 3.0 engagements, characterized by advanced technologies, such as blockchain, decentralized systems, and peer-to-peer networks, are demanding the growth of the metaverse (Mystakidis, 2022; Yoo et al., 2023). Whilst still in its infancy, it promises more immersive customer experiences (CX) than those provided by traditional and virtual environments (Mogaji, Wirtz, et al., 2023; Yoo et al., 2023).

The metaverse economy has a projected market value of US\$800 billion in global revenues, which consists of various sectors such as online gaming, social media, retail, and live events by 2024 (Bloomberg Intelligence, 2021; Hollensen et al., 2023) and US\$1.3 trillion by 2030 (Precedence Research, 2023). Technology giants (e.g., Meta, Microsoft, and Google) (Biba, 2022; Gray, 2022), brands (e.g., Adidas, Gucci, and Samsung) (Murad & Smale, 2022; Semmence, 2023), fast-food chains (e.g., McDonald's and Wendy's) (Marr, 2022; Meisenzahl, 2022), and even professional sports teams (e.g., Manchester City and Barcelona) (Dahunsi, 2022; Reuters, 2022) are actively exploring opportunities to develop novel and engaging "customer experiences in the metaverse" (CXMV) (Yoo et al., 2023). Research has begun to examine the behaviors of metaverse customers across a range of areas, including services marketing (Gadalla et al., 2013; Kozinets, 2023), advertising (Ahn et al., 2022), branding (Lee et al., 2023), and retail (Jafar et al., 2023; Juran & Joonheui, 2023).

CX is generated through interactions between customers and experience partners (e.g., brands, employees, and other customers) in an omnichannel environment, which occur at various touchpoints along the customer journey—in both online and offline channels and at the prepurchase, purchase, and post-purchase stages (Rahman, Carlson, Gudergan, et al., 2022). The metaverse is a new channel for retailing, wherein customers are empowered to navigate virtual spaces and virtual retail stores in the form of a unique "avatar" whilst engaging with other avatars in the virtual space. In this way, the metaverse offers a parallel retail universe to brick-and-mortar retail settings and mimics the real world (Yoo et al., 2023). Thus, metaverse platforms are expected to transform the retail sector by providing retailers and brands with a new technologically advanced channel through which to engage customers and target customers across the customer journey (Keegan et al., 2023). This in turn will enable brands to enhance their visibility in an expanding virtual retail landscape.

The benefits to brands that are able to develop an excellent CXMV are significant. Previous research demonstrates that a seamless CXMV leads to increased profitability and meaningful value for the firm (Dwivedi et al., 2022; Jiang et al., 2023; Yoo et al., 2023). This value may occur through four mechanisms. First, an excellent CXMV can inspire customers to continue and increase their metaverse usage, contributing to user growth in metaverse platforms (Dwivedi

et al., 2022; Jiang et al., 2023). Second, direct digital purchases within the metaverse facilitate additional revenue for brands selling digital products. In addition, metaverse platform operators receive a share of that revenue. Third, the ability of customers to customize their avatars with unique digital goods can also add value through enhanced enjoyment (Dwivedi et al., 2022). Fourth, brands can also extract significant value by converting customers' brand interest within the metaverse to concrete purchase intentions in the real world (Dwivedi et al., 2022). This exchange of value among key actors (e.g., customer avatars, brands, and metaverse platform operators) interacting in the metaverse represents a key growth opportunity for both brands and metaverse platforms (Dwivedi et al., 2022; Shin, 2022). However, research on how digital purchases in metaverse platforms influence real-world purchase behaviors is limited to date (Park & Kim, 2024).

In this study, underpinned by service-dominant (S-D) logic as the overarching theoretical lens, we recognize that the metaverse offers actors, including avatars, AI assistants, and brand communities, a platform through which they may mutually benefit each other in a service-to-service exchange (Hadi et al., 2023; Vargo et al., 2023; Vargo & Lusch, 2008; Yoo et al., 2023). In turn, actors' co-creative engagement and socially rich experiences within the metaverse can help to generate and support a positive CXMV (Gahler et al., 2023; Hadi et al., 2023; Vargo & Lusch, 2008). CXMV is considered a customer's subjective and directed mental response to interactions with others within a channel (Gahler et al., 2023). An excellent experience is characterized by a positive affective, cognitive, physical, relational, sensorial, and symbolic experience across the customer journey (Gahler et al., 2023; Gentile et al., 2007; Keyser et al., 2020). In the retail sector, effective customer experience management has been found to enhance customer satisfaction, loyalty, word-of-mouth referrals, and purchase intentions (Chen & Yang, 2021; Roy et al., 2017; Siqueira et al., 2019). Nevertheless, scholars have yet to examine how customer experience operates in new retail contexts such as the metaverse. By allowing customers to interact with each other and brands via avatars, novel and immersive experiences can be created (Dwivedi et al., 2023; Hollensen et al., 2023). Given the multisensory interactions among avatars, metaverse platforms are highly social (Hadi et al., 2023; Oh et al., 2023), empower customers to express their identities, and foster community cohesion (Ball, 2022; Richter & Richter, 2023). In addition, they enable users to customize their avatars with branded digital products (see Figure 1), which they can try on and purchase either in digital form or in the real world.

To date, little is known about how a positive CXMV can be developed and maintained or how CXMV influences important marketing outcomes such as customers' metaverse usage and purchase intentions (Kaur et al., 2023; Park & Kim, 2024; Shin, 2022). Gursoy et al. (2023) point out that compared to previous technology-enabled experiences, the metaverse offers "technology-illusory experiences, which represent the most advanced level of technology integration in purchase experience co-creation" (p. 6), thus, by corollary, enhancing the CXMV. Deloitte. (2022) also notes that the decentralized structure of Web 3.0 offers users and brands a novel and disruptive approach to value exchange and experience; however, "no one has a clear picture

FIGURE 1 Customized avatars in a Metaverse Gucci store.



of what the metaverse and Web 3.0 will ultimately become.” From an empirical perspective, research has neither examined yet how CXMV can be developed and maintained nor the benefits of this for brand management. Thus, there is a pressing need for retail marketing managers to understand critical aspects of users' diverse experiences in the metaverse (Deloitte., 2022; Eggenschwiler et al., 2024; Yoo et al., 2023). Moreover, studies on the specific mechanisms by which metaverse platform operators can capitalize on consumer behaviors to influence real-world transactions are warranted (Hadi et al., 2023). To this end, this study aims to answer the following research questions: *How does CXMV influence customers' intentions to revisit metaverse platforms? How does CXMV influence both metaverse and real-world purchase intentions?*

To answer these questions, this study advances a new empirical framework for CXMV with two critical antecedent factors for generating positive CXMV in the metaverse: *social presence* and *trialability*. Both social presence and trialability are believed to influence CXMV (Hadi et al., 2023; Koohang et al., 2023). Social presence refers to the way users feel connected to each other. For example, prior research by Hasenbein et al. (2022) found that eye gaze and the use of unique hand gestures by avatars within the metaverse enhance users' experiences. These social cues enrich interaction, which supports social presence. Thus, we conceptualize social presence as the degree to which customers perceive their avatar-mediated social interactions within the metaverse as mimicking their real-world social experiences (Hadi et al., 2023; Oh et al., 2023). In contrast, we conceptualize trialability as the ease with which customers are able to try products within the metaverse (Koohang et al., 2023; Roggeveen et al., 2020). For example, stereoscopic displays within VR headsets have been found to assist customers in assessing product form, fit, and size, thus improving users' ability to try products, reducing perceived risk, and enhancing purchase intention (Kang et al., 2020).

However, to date, limited empirical research has examined how these specific factors influence CXMV. In addition, it is yet to be empirically determined whether a positive CXMV influences a customer's digital purchase intentions in the metaverse and whether this

intention spills over into real-world purchase intentions, an outcome that is important for brand management. This study addresses this research gap by examining the connection between metaverse and real-world consumer behaviors (Dwivedi et al., 2022; Hadi et al., 2023).

The implications of this study extend to omnichannel retailing, brand management, metaverse platform management, and customer relationship-building contexts, resulting in three main contributions to marketing. First, our model demonstrates how customers assess their CXMV. To date, no holistic model encompassing both the antecedents and the outcomes of CXMV has been developed; thus, our model is one of the first comprehensive conceptualizations of customers' responses to their metaverse experiences. Second, by empirically testing a model that includes both metaverse usage and purchase intentions, we provide a coherent, evidence-based framework for successful metaverse retailing. Third, the model identifies the antecedents of an excellent CXMV for both early-stage and long-term metaverse users, enabling retail managers to appropriately allocate resources according to customer segment and quantify the effects of these investments on important brand-related outcomes. Thus, we extend the omnichannel retail research to include the metaverse as a new retail channel. Fourth, we operationalized the scales for measuring key constructs in the metaverse context, such as social presence, trialability, customer experience, platform usage intention, purchase intentions in the immersive metaverse platform, and purchase spill-overs from virtual platforms to the real world. Future studies will benefit from utilizing these measures and advancing relevant literature.

The paper is structured as follows: Section 2 presents a comprehensive review of the literature on the key theoretical constructs of our conceptual framework— CXMV, social presence, and trialability (also see Appendix Tables A.1–A.3). Building on S-D logic to develop the hypotheses, Section 3 explores how social presence and trialability influence CXMV and customers' metaverse usage and digital and real-world purchase intentions. Users' metaverse platform experience (early-stage vs long-term) is considered as a contingency factor. Section 4 presents the research methodology and data collection and

analysis. Section 5 presents the results of the hypothesis testing. Section 6 discusses the findings, presents the theoretical and managerial implications of the study, and outlines future research directions.

2 | LITERATURE REVIEW

2.1 | Customer experience in the metaverse

CX has been broadly defined as a customer's subjective, directed, and multidimensional mental response to an interaction with an experience partner at a given touchpoint during the customer journey (Gahler et al., 2023; Lemon & Verhoef, 2016). Based on this definition, six dimensions of CX have been operationalized in traditional online and offline channels: affective, cognitive, physical, relational, sensorial, and symbolic (Gahler et al., 2023). We extend the literature on traditional CX and propose that CXMV offers a unique, novel, and more co-creative experience than traditional channels of exchange (Buhalis, Leung, et al., 2023; Buhalis, Lin, et al., 2023; Koohang et al., 2023). Several aspects of the metaverse contribute to the creation of this unique CXMV, including its immersive, co-evolutionary, and symbiotic nature (Hadi et al., 2023; Koohang et al., 2023). In the metaverse, cutting-edge technologies deliver a technologically based and illusionary CXMV that merges the physical and virtual channels (Buhalis, Leung, et al., 2023; Buhalis, Lin, et al., 2023; Golf-Papez et al., 2022), enabling users to transition effortlessly between "worlds" (Golf-Papez et al., 2022; Koohang et al., 2023).

Moreover, meaningful interactions with other "actors" in the metaverse, including other avatars, brands, AI assistants, and virtual influencers, empower customers to co-control virtual spaces at every stage of their customer journey, facilitating high levels of personalization and co-experience (Giang Barrera & Shah, 2023; Koohang et al., 2023). Different co-creating activities, such as social events, trading, and product trial, in turn, offer real-time data for evaluating purchasing habits during immersive retail experiences (Hollensen et al., 2023; Nica et al., 2022). As a result, CXMV offers brands a dynamic tool to actively enhance brand loyalty, increase purchase intention, and foster positive recommendations (Golf-Papez et al., 2022; Hadi et al., 2023).

Scholars have begun to empirically explore aspects of CXMV, including its effect on happiness (Jiang et al., 2023), self-congruence, and flow (Park et al., 2023), as well as the effect of metaverse features on users' embodied experiences (Shin, 2022) and organismic CX (Jafar et al., 2023).¹ Jiang et al. (2023) found that in the context of luxury brands, fantasies, feelings, and fun were crucial for generating an excellent CXMV because consumers seek enriching and immersive experiences that develop the brand narrative and expand upon the product. Park et al. (2023) found that when the avatar and the real user share a similar appearance, this creates an immersive and enjoyable experience during virtual interactions, which enhances customers' intentions to purchase in the virtual environment. In addition,

Shin (2022) found that CXMV is enhanced through embodied features and platform immersiveness during active interactions. It is also enhanced when a customer's digital persona and brand image are congruent (Juran & Joonheui, 2023).

Several unique aspects of the metaverse contribute to the creation of CXMV. These include immersiveness, social presence, trialability, interoperability, digital ownership, and customer identity (Hadi et al., 2023; Koohang et al., 2023). However, social presence and trialability are considered two of the most important drivers of positive CXMV (Fan et al., 2022; Keegan et al., 2023; Koohang et al., 2023). For example, Torro and Pirkkalainen (2023) found that CX can be enriched by social presence, which is enhanced by realistic verbal and nonverbal cues and communication processes. Kim et al. (2021) determined that trialability features in the VR environment, facilitated by interactivity and vividness, generate memorable CXs. However, the roles of social presence and trialability in the metaverse have yet to be empirically examined. From an industry perspective, it is critical for management to understand the impact of CXMV on brand-related marketing activities, including spillover effects, which encourage customers to extend their purchases from the virtual world to the real world (Dwivedi et al., 2023; Koohang et al., 2023).

2.2 | Social presence in the metaverse

Social presence² was first conceptualized by Short et al. (1976) as the "degree of salience of the other person in the interaction and the consequent salience of the interpersonal relationships" (p. 65), thus referring to feelings of immediacy and intimacy. Social presence represents "the feeling of being with another person" (Bioocca et al., 2003, p. 9), reflecting psychological closeness (Gao et al., 2018). Social presence has been found to stimulate positive psychological responses, such as feelings of trust, and behavioral responses, such as increased purchase intentions and word-of-mouth recommendations in both offline (Grewal et al., 2020) and online retail settings (Cyr et al., 2007; Hassanein & Head, 2007). Given that social presence is determined by users' ability to project their identities, build community, and create social cohesion, the concept is thought to be central to a seamless CX (Gunawardena, 1995; Kreijns et al., 2022).

Kreijns et al. (2022) note that in computer-mediated environments, social presence is enhanced by computer-mediated communication (CMC) tools and digital platforms in conjunction with a social space that allows interpersonal relationships via a sense of community, group climate, or mutual trust between participants. Thus, in the context of AR, VR (Sereno et al., 2022; Torro & Pirkkalainen, 2023), or CMC environments that utilize chatbots, AI (Appel et al., 2012; Cheng & Jiang, 2020), or avatars (Kim et al., 2023), social presence is generated by participants experiencing a sense of both telepresence (a vivid spatial experience) and self-presence (the connection of one's virtual self to one's actual self) (Oh et al., 2018). Social presence has been found to enhance user experiences in AI (Jiang et al., 2022;

¹See Table A.1 for a summary of the studies on customer experience in metaverse platforms.

²Table A.2 provides a summary of the research on social presence in virtual environments.

Toader et al., 2019), AR (Lavoye et al., 2023), and VR (Barnes, 2016) channels.

Fundamentally, CXMV depends on users' ability to socially connect, communicate, and coexist within a diverse community of actors (Hadi et al., 2023; Hennig-Thurau et al., 2023). The 3D virtual environments of the metaverse can offer vivid visual cues about the surroundings of the actors and enable them to move across different settings and manipulate the space (H.J. Oh et al., 2023; Van der Land et al., 2011). Additionally, interaction through avatars in the metaverse can simultaneously produce and increase the number and intensity of communication-rich cues, including aspects such as appearance, gesture, and behavior (Hennig-Thurau et al., 2023; Van der Land et al., 2011). Specifically, avatars in the metaverse convey nonverbal cues and relational information, thereby creating a sense of social presence and experiences (Biocca et al., 2003; Gao et al., 2023). Facilitated by face tracking technologies and haptic support, avatars can provide users with lifelike experiences, fostering a sense of direct interaction with other social actors in the virtual environment (Kim et al., 2023; Richter & Richter, 2023). Consequently, these features create a non-mediated perception, reducing awareness of intervening technologies, leading to a social illusion and a strong, cohesive feeling among actors (Hennig-Thurau et al., 2023; Lombard & Ditton, 1997; Oh et al., 2023; Yadav & Varadarajan, 2005). Thus, the feeling of co-existence and engagement through communication-rich cues within the metaverse leads users to perceive a social presence as if other users are physically present in the same environment (Oh et al., 2023; Short et al., 1976). Through this communal social presence, customers, brands, and channel operators (e.g., retailers and metaverse platforms) can co-create rich and meaningful metaverse experiences for themselves and one another (Yoo et al., 2023).

Overall, the metaverse literature agrees that social presence is a critical factor in creating positive and engaging CXMV (Hadi et al., 2023). However, the role of social presence within the contemporary field of metaverse retailing is an under-researched area (e.g., Hennig-Thurau et al., 2023; Oh et al., 2023) and calls for empirical investigations (Bruni et al., 2023).

2.3 | Trialability in the metaverse

Trialability³ is conceptualized as the ability of customers to trial and experiment with a brand or product before purchase (Bonfanti & Yfantidou, 2021; Roggeveen et al., 2020). In brick-and-mortar retail (i.e., try-before-buy), trialability is facilitated through the provision of samples, showrooms, or events, which allow customers to experience a brand or product in a tactile way (Roggeveen et al., 2020). Within computer-mediated environments, trialability is offered via VR and AR technologies, which enable customers to manipulate, review, and personalize products before purchasing (Bonfanti & Yfantidou, 2021; Hilken et al., 2017; Huang, 2019; Roggeveen et al., 2020). As such, trialability offers firms a way to reduce customer-perceived risk and,

in turn, enhance their sense of confidence in the brand or product before purchase (Kang et al., 2020; Rese et al., 2017). Numerous research studies have identified trialability as an important factor in enhancing purchase intentions in brick-and-mortar retail settings (Bonfanti & Yfantidou, 2021; Roggeveen et al., 2020), as well as in pure-play retail stores (Han et al., 2018; Zhang et al., 2019), AR environments (Hilken et al., 2017; Huang, 2019), and VR retail settings (Bonetti et al., 2018; Liu et al., 2020).

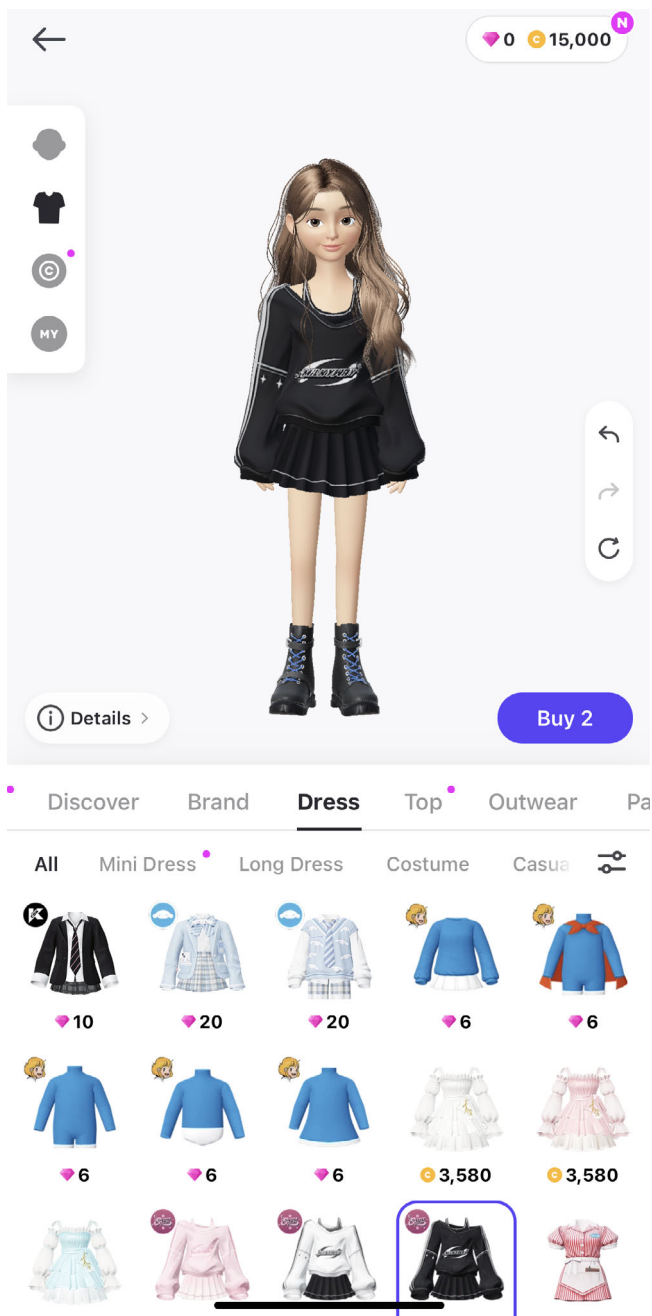
The metaverse offers a new channel through which brands can support customer trialability since customers can be offered unique, realistic, and personalized 3D experiences with brands and products in the metaverse platforms (Dwivedi et al., 2023; Spajić et al., 2022). In addition, several other innovative metaverse technologies may also be employed to enrich the trial experience, including virtual fitting rooms, showrooms, and displays, as well as interactive simulations (Dwivedi et al., 2023; Shams et al., 2023; Spajić et al., 2022; Yim et al., 2017). These innovations offer customers a more immersive brand and product experience and may act to support customer confidence in decision-making at the point of purchase. In the case of apparel, customers are able to try on products to assess fit, view fit from multiple angles, seek expert advice from virtual staff, and customize the servicescape to assess the contextual fit of the item (Cobben, 2022; Dwivedi et al., 2023; Tan et al., 2023). Unlike Web 2.0 technologies, which limit customer viewing of items to a 2D image, metaverse platforms allow customers to convert products to 3D products to facilitate virtual try-ons (Bhatnagar, 2023). This provides customers with an immersive environment that is akin to the real world (Cobben, 2022).

The metaverse enables customers to interact with one another and with creators and brands in dynamic and interconnected ways (Dwivedi et al., 2023; Koohang et al., 2023; Spajić et al., 2022). It thus also enables customers to actively engage with brands and products in novel ways (Koohang et al., 2023; Spajić et al., 2022). Unlike brick-and-mortar retail, the metaverse enables customers to experiment with brands and products virtually, before visiting a physical store (Koohang et al., 2023) or before ordering the product and having it delivered to their home (Golf-Papez et al., 2022; Koohang et al., 2023). As a result, trialability assists customers in making a full initial assessment of the brand or product and its ability to meet their consumption needs (Tan et al., 2023). Trialability in the metaverse also benefits brands because it enables them to test their offerings prior to launch in the real world in a cost-effective manner (Knight, 2023; Kostar, 2022). However, despite the importance of trialability in contemporary marketing (Roggeveen et al., 2020), its influence on CXMV and purchase intentions in the metaverse has not been empirically assessed.

3 | HYPOTHESIS DEVELOPMENT

This section first introduces S-D logic as the theoretical basis of the conceptual framework before presenting the main and moderating hypotheses.

³Table A.3 summarizes the research on trialability in virtual environments.



Source: Screenshot from Zepeto World mobile app (May 2024).

FIGURE 2 Avatar customization with branded products in Metaverse platforms.

3.1 | Service-dominant logic

The integrative metatheoretical perspective of S-D logic put forward by Vargo et al. (2023) asserts that all service innovation (e.g., metaverse platforms) is emergent, necessitates distributed governance, and is informed and underpinned by symbiotic design. These elements are additionally grounded in the institutional and combinatorial processes of connected actors (i.e., metaverse platform providers, users' avatars, brands with their products and services) integrating resources and co-creating value (Vargo et al., 2023). S-D logic's

service orientation thus transcends the divide between both service and product innovation, as well as the divide between physical and digital service innovation, because innovation occurs within social structures and nested sociotechnical systems. This makes S-D logic an appropriate lens through which to examine the metaverse (Vargo & Lusch, 2014).

The metaverse also lends itself to a systems-thinking approach due to its highly interconnected, self-organizing, and co-evolutionary nature. No single focal actor determines experiences or outcomes. Additionally, due to the metaverse's symbiotic nature, a wide variety of institutions are required to evolve for it to be perceived as legitimate by its collective actors. Vargo et al. (2023) highlight the intersection and symbiotic relationship between institutional technologies, market dynamics, and consumers' novel experiences within the metaverse. Vargo et al. state that "institutions that define possessions (NFTs instead of physical land plots), exchange (digital instead of stat regulated currencies), how we experience the world (through VR headsets), and ultimately, what we perceive as the world need to be negotiated to become aligned" (pp. 239–240). The metaverse is therefore unique in that it is characterized by increased digitization, which speeds up the emergence of novel outcomes, cost-effective exchanges among mass actors, and user communities that can collectively shape the service ecosystem they are in Vargo et al. (2023). In addition, the metaverse also offers actors the ability to exchange services in "liquefied" and "dematerialized" forms (Normann, 2001), heightening resource density by virtue of resource (re)combination and facilitating more efficient exchanges (Vargo et al., 2023). By blurring the division between the physical and virtual world, the metaverse as a disruptive digital service innovation (DSI) fundamentally transforms how actors interact and exchange (Hennig-Thurau et al., 2023).

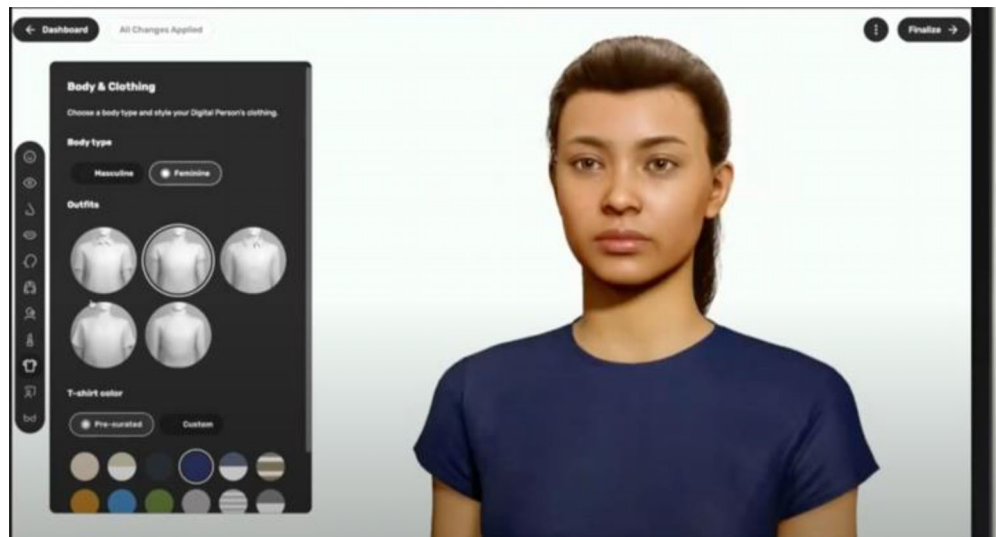
By adopting S-D logic as our theoretical framework, we recognize that the metaverse offers actors, including avatars, AI assistants, and brand communities, a platform through which they may mutually benefit each other in a service-to-service exchange (Hadi et al., 2023; Vargo & Lusch, 2008; Yoo et al., 2023). In turn, actors' co-creative engagement and socially rich experiences within the metaverse can help to generate and support a positive CXMV (Gahler et al., 2023; Hadi et al., 2023; Vargo & Lusch, 2008). For instance, in Gucci's virtual space on the ZEPETO metaverse platform (see Figure 2), users can customize their virtual encounters alongside other customer avatars by exploring themed rooms and browsing a boutique showcasing virtual Gucci products (Adegeest, 2021). These socially rich experiences in the metaverse can enhance CXMV (Gahler et al., 2023; Hadi et al., 2023; Vargo & Lusch, 2008).

3.2 | Main effects

3.2.1 | Influence of social presence on customer experience

In the brick-and-mortar retail setting, social presence is essential for establishing warm and intimate relationships with customers (Jiang

FIGURE 3 Realistic avatar in a Metaverse platform. From *Creating, Deploying, Sharing a Digital Influencer*, by Soul Machines, 2023 (screenshot from video—<https://youtu.be/Jq86iaEcHYo?si=O6dOj4D88J5h9sRs>). Copyright 2023 by Soul Machines.



et al., 2022; Ogonowski et al., 2014). In e-commerce and bricks-and-clicks retail settings, social presence is a key enabler of customer trust, online purchases, loyalty, satisfaction, and enjoyment (Argo et al., 2005; Cheng & Jiang, 2020; Jiang et al., 2022; Lu et al., 2016; Ogonowski et al., 2014; Ye et al., 2019; Ying et al., 2021). Research has shown that socially rich text and images embedded in e-commerce sites for the purposes of interaction enhance CX (Hassanein & Head, 2007). Another study found that the “physical embodiment” of AI-based customer service robots creates a strong sense of social presence through greater participant engagement and interactions (Adam et al., 2021). Similarly, social presence is enhanced when e-commerce chatbots are endowed with humanlike characteristics, positively influencing CX (Jiang et al., 2022).

In this study, we propose that social presence also plays a pivotal role in shaping CXMV. Bente et al. (2008) found that social presence in virtual environments is enhanced by eye contact with other avatars, which stimulates sensorial, affective, and relational experiences (see Figure 3). Similarly, studies have found that social presence is enhanced by avatars having a humanlike voice (Kim et al., 2022; Stein, 2022) or through mediated touch in the form of haptic feedback (Wedel et al., 2020), which evokes sensory, affective, relational, and cognitive experiences (Barreda-Ángeles & Hartmann, 2022; Kim et al., 2022). These visual, verbal, and sensory cues are key to generating positive experiences in social settings (Grewal et al., 2020).

While face-to-face interactions are generally considered the gold standard for generating a sense of social presence, the metaverse, as a parallel digital world, may have equivalent potential (Biocca et al., 2001; Gao et al., 2023; Hadi et al., 2023) because avatars can convey nonverbal cues and relational information and modify their behaviors in real time, enabling participants to coexist within a shared virtual space (Barreda-Ángeles & Hartmann, 2022; Bente et al., 2008). Temporal synchronicity, where time is experienced consistently by all users through immersiveness, is another important component of the metaverse, which mirrors features of the physical world (Hadi et al., 2023; Hoffman & Novak, 1996). Consequently, interactions

with other users in the metaverse may produce a strong sense of social presence that is akin to that generated by face-to-face interactions (Hadi et al., 2023) and is thus a determinant of an enhanced CXMV.

Moreover, the metaverse is capable of stimulating a highly immersive CXMV and can evoke the sense of interacting in a live environment (Hadi et al., 2023; Shin, 2022). For instance, actors can enhance their communication experience within the metaverse by navigating various environments and manipulating spatial elements (Oh et al., 2023). In addition, avatar-mediated communication generates rich cues (appearance, gesture, behavior), fostering a sense of co-existence and social presence among users (Short et al., 1976; Van der Land et al., 2011). Therefore, interacting with other actors in metaverse platforms produces a strong sense of social presence, akin to that of face-to-face interactions. As a result, metaverse platforms have the ability to augment real-life social interactions among actors (Hadi et al., 2023). Building on the discussion thus far and the extant empirical evidence of the positive influence of social presence on CX in various channels (e.g., Adam et al., 2021; Barnes, 2016; Hassanein & Head, 2007), we propose the following hypothesis:

H1. Social presence in the metaverse positively influences CXMV.

3.2.2 | Influence of trialability on customer experience

Trialability in the metaverse is a crucial factor shaping overall CXMV (Koochang et al., 2023; Mogaji, Dwivedi, et al., 2023). Metaverse actors include users and their virtual representations (i.e., avatars), brands offering products, and the larger metaverse community, all of whom co-create the experience (Dwivedi et al., 2023; Vargo & Lusch, 2014). Together, these metaverse actors create a unique and novel CXMV by interacting with branded products through various activities

(Arya et al., 2024; Buhalis, Lin, et al., 2023; Gahler et al., 2023; Kostar, 2022). Thus, using their avatars, metaverse customers can trial branded products, providing them with a highly engaging CXMV (Keegan et al., 2023; Spajić et al., 2022).

The metaverse revolutionizes the consumer journey by providing immersive, near-realistic experiences that facilitate trialability, streamlining the consumer's exploration and internalization of upcoming consumption (Gursoy et al., 2023; Idrees et al., 2023). Moreover, it empowers consumers with realistic expectations through novel technologies such as haptic gloves and sensory clothing, allowing consumers to engage in multisensory experiences and make informed decisions by virtually exploring products in real-time (Gursoy et al., 2023). This, in turn, enhances consumer confidence in their decision-making by reducing consumers' perceived risk in purchase (Idrees et al., 2023). This trialability feature not only addresses the challenges of size selection and fitting prevalent in online shopping but also significantly enhances the overall shopping experience through advanced technological capabilities (Idrees et al., 2023). Moreover, the trialability feature can also be experienced on traditional mobile phones, which enhances convenience and creates CXMV (Realize Innovations, 2023).

The positive relationship between trialability in the metaverse and CXMV can be explained by regulatory focus theory, which posits that individuals exhibit either a promotion or a prevention focus when self-regulating the motivations driving their behaviors (Higgins, 1998). Individuals with a promotion focus are driven by growth, aspiration, and accomplishment (Das, 2015; Higgins, 1998). In the metaverse context, these individuals may strive to generate an aspired version of themselves through their avatars. In this case, user–avatar congruence is critical because the customer's sense of identity plays a pivotal role in shaping their CXMV and, consequently, their purchase behaviors (Park & Kim, 2024; Reed et al., 2012). An individual's identity significantly influences their affiliations with social groups (Escalas & Bettman, 2005), brand preferences (Hsu, 2023; Kirmani, 2009), responses to digital representations (Yee et al., 2009), and receptiveness to advertising (Forehand et al., 2002). In the retail setting, customer identity has been found to positively influence CX, brand loyalty, and purchase intentions (Celuch & Walz, 2020; Grzeskowiak et al., 2016; Huang, 2012; Yee et al., 2009). In the metaverse, actors may trial branded products to achieve an aspirational version of themselves, enhancing their CXMV (Gahler et al., 2023; Higgins, 1998; Mogaji, Dwivedi, et al., 2023). Additionally, promotion-focused actors have been found to engage in activities such as customization of products/services and analyzing the fit of branded digital goods (e.g., garments) through features like heat maps in order to support their consumption goals (Idrees et al., 2023; Lim & Jafari, 2021; Trimirror, 2021).

In contrast, individuals with a prevention focus are motivated by safety, responsibility, and the avoidance of loss (Higgins, 1998). Trialability in the metaverse caters to the needs of these individuals by providing a risk-free means of evaluating products prior to purchase (Mogaji, Dwivedi, et al., 2023). For example, in the metaverse, mobile 3D body scanning enables users to seamlessly integrate avatars that

are highly detailed and aligned with an individual's body dimensions through cutting-edge technologies like AR and VR (Idrees et al., 2023). This immersive experience enhances the virtual shopping experience for prevention-focused consumers whilst also mitigating risks, preventing losses, and increasing confidence during the customer journey (Higgins, 1998; Mogaji, Dwivedi, et al., 2023; Wirtz & Lwin, 2009).

Prior empirical research has found that promotion-focused customers prioritize positive outcomes, such as experience, when evaluating brand extensions, while prevention-focused customers emphasize risk perception (Yeo & Park, 2006). Similarly, Roy and Ng (2012) demonstrated that promotion-focused individuals favor products with hedonic benefits, aligning with a positive experiential aspect, while prevention-focused individuals exhibit more favorable attitudes toward products emphasizing utilitarian benefits, thus enriching CX by reducing risk. Drawing on regulatory focus theory and current empirical findings on the positive effect of trialability on CXMV across different channels (e.g., Bonfanti & Yfantidou, 2021; Hilken et al., 2017; Liu et al., 2020; Zhang et al., 2019), we propose the following hypothesis:

H2. Trialability of branded products in the metaverse positively influences CXMV.

3.2.3 | Influence of customer experience on users' intentions to use the metaverse

Building on S-D logic, this study emphasizes the co-creation of value during immersive and socially rich metaverse interactions. Prior research within online and virtual environments suggests a significant relationship between a positive CX and increased user intentions to use metaverse platforms (Deng et al., 2010; Qin, 2021). In online settings, understanding customer usage patterns in the metaverse fosters cognitive absorption, leading to positive emotions and satisfaction, and ultimately promoting continued usage (Deng et al., 2010). In addition, the diversity of participatory activities within the metaverse such as gaming, socializing, and platform development amplifies customers' positive emotions. When consumers share experiences through various co-creating activities, the customer experience is more realistic (Hadi et al., 2023). These collaborative interactions, which are characterized by usefulness, curiosity, positive mood changes, alignment with personal beliefs, and connections with others, in turn, support a subjective positive mental response—the essence of CXMV (Gahler et al., 2023; Hollensen et al., 2023; Koohang et al., 2023). Consequently, the unique value co-creation system in the metaverse creates a favorable interactive environment for customers, fostering continued platform use (Hsu & Lu, 2004). This shows that CXMV can transcend CX in traditional online and virtual worlds; therefore, this study posits that a well-crafted CXMV directly influences users' intention to continue using a metaverse platform:

H3. A positive CXMV enhances users' intentions to continue using the metaverse.

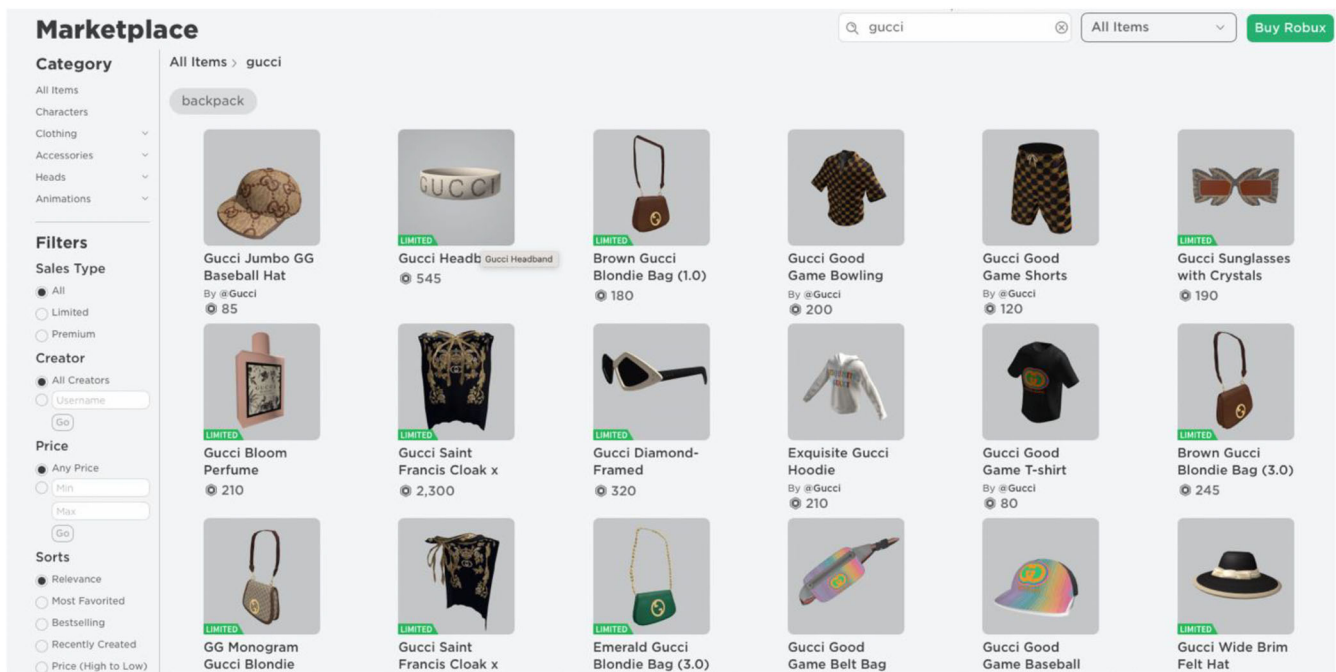


FIGURE 4 Marketplace of virtual goods on the Roblox Metaverse platform. From *Marketplace*, by Roblox, 2023 (screenshot from the Roblox metaverse platform). Copyright 2023 by Roblox.

3.2.4 | Influence of customer experience on digital purchase intentions

Previous studies underpinned by S-D logic have demonstrated that interactions between actors can generate positive CXs, triggering value exchange and subsequently influencing customers' purchase intentions (Cao et al., 2023; Hussain et al., 2022; See-To & Ho, 2014). Several virtual worlds have established flagship stores for prominent brands, fostering customer interaction, enabling direct experimentation with virtual objects, and ultimately influencing users' purchase intentions regarding the virtual objects. Empirical research has demonstrated that interactions between avatars can generate positive CXs, increasing customers' intentions to purchase virtual products (Animesh et al., 2011; Moon et al., 2013). Similarly, positive relationships between avatars have been found to heighten the likelihood of customers purchasing virtual avatar skins (Juran & Joonheui, 2023; Park & Kim, 2024). This positive interaction between avatars, in turn, creates a positive and memorable CX (Retail Dive, 2022) (see Figure 4).

The advanced technological features of the metaverse also support consumers' digital product purchase intentions. During their purchase journey, consumers interact directly with branded products, enabling them to assess quality, functionality, and aesthetic appeal, and enabling them to try on products (Golf-Papez et al., 2022). They can also transfer unique ownership via blockchain technology (Yoo et al., 2023). These features enrich the CXMV and amplify value exchange by offering novel virtual assets (Dwivedi et al., 2023; Park & Kim, 2024). This allows customers to redefine unique ownership, express individuality through personalized avatars, and create a

dynamic and novel CX within their community. Ultimately, this motivates them to purchase digital branded products (Yoo et al., 2023), thereby exchanging value with brands by investing in branded products for their avatars (Dwivedi et al., 2023; Giang Barrera & Shah, 2023; Koohang et al., 2023).

The motivation behind purchasing branded digital goods in the metaverse is underpinned by two psychological theories: self-verification and self-enhancement (Sedikides & Gregg, 2008; Swann, 2012). According to the self-verification theory, individuals seek confirmation and validation of their positive or negative self-concept (Swann, 2012; Swann & Read, 1981). In the context of the metaverse, a positive customer experience, which may include positive interactions and approval from other actors, aligns with individuals' desired self-perceptions (Hadi et al., 2023). When users have positive experiences in the metaverse, they may be inclined to enhance and express their virtual identity by acquiring branded digital goods for their avatars (Koohang et al., 2023). This aligns with the self-verification theory as individuals are motivated to maintain a consistent and positive self-concept, even in virtual channels (Ma et al., 2021; Swann, 2012). Similarly, drawing from self-enhancement theory, individuals in the metaverse are motivated to maintain and enhance positive perceptions of themselves (Hadi et al., 2023; Sedikides & Gregg, 2008). In this context, acquiring branded digital goods becomes a tool for users to express and reinforce a positive virtual identity, aligning with the motive to present themselves favorably, even in digital channels (Yoo et al., 2023).

Empirical evidence based on self-verification and self-enhancement theories demonstrates that a positive customer experience supports purchase intentions (Ma et al., 2021; Shan et al., 2022;

Yang et al., 2018). Recent empirical evidence found that the metaverse's highly collaborative and social nature enhances overall CX and motivates users to customize their avatars (Park & Kim, 2024). Thus, the study proposes the following hypothesis:

H4. A positive CXMV enhances users' purchase intentions in the metaverse.

3.2.5 | Influence of customer experience on virtual-real-world purchase spillovers

During their omnichannel purchase journey, customers engage and exchange value with brands and other customers by learning about brands and products, purchasing products, and sharing their experiences in the same or different channels (Shi et al., 2020). The driving mechanism of a brand's omnichannel operations is the transfer of CXs across its channels. To this end, metaverse platforms are a new channel for brand engagement and virtual brand community development (Koohang et al., 2023). The immersive and social nature of metaverse platforms, supported by the trialability features, offers a unique opportunity for customer-brand interactions in the omnichannel mix (Koohang et al., 2023; Ramadan, 2023).

The Proteus effect, which is based on self-perception theory, has been employed to explain the psychological effects of digital self-representation (Hadi et al., 2023; Yee & Bailenson, 2007). The Proteus effect suggests that individuals tend to shape their real-world behavior and attitudes based on their avatars' characteristics and identities in the virtual environment (Yee & Bailenson, 2007). Empirical research has found that individuals' emotions, cognitions, and other internal states are inferred by observing one's own behavior (Yee & Bailenson, 2007). Therefore, drawing upon the Proteus effect, we suggest that individuals tend to mold their real-world consumption attitudes and behaviors to match their avatars' characteristics and identities in the virtual environment (Yee & Bailenson, 2007). This is because avatars are a reflection of the self. Personalization is a purposeful act of self-expression linking cognition and motivation to future conduct (Wu et al., 2023). Given that avatars are considered mirrored reflections of the self, avatars that have been constructed to resemble their creator may act as mirrors promoting self-awareness (Wu et al., 2023). This effect may filter across both virtual and real worlds, subsequently shaping purchase behaviors in both.

In the metaverse, a socially driven environment by fellow actors, avatars' attitudes and behaviors, which encompass appearance, personality traits, and interaction styles, are additionally molded by the expectations set by other avatars (Hadi et al., 2023). As a consequence of self-perception and behavioral confirmation theory, an individual's personality, traits, and behaviors become internalized in the metaverse through their avatars (Hadi et al., 2023). The behaviors and attitudes formed in the metaverse can subsequently impact real-world behavior, reinforcing the Proteus effect by aligning individuals'

identities with the patterns established in the virtual channels (Hadi et al., 2023; Yee & Bailenson, 2007).

Drawing on the Proteus effect to explain "how avatars affect individuals" (Liu, 2023), we extend this approach and suggest that the Proteus effect positively influences spillover behavior in the real world (Peck et al., 2013; Sah et al., 2017; Yee et al., 2009). For instance, Yee et al. (2009) found that avatars embodying taller individuals in virtual environments exhibited more confidence and assertiveness than shorter avatars in the virtual world and demonstrated similar behaviors in subsequent face-to-face interactions in the real world. Similarly, a study found that when people are encouraged to create avatars representing ideal versions of themselves, they make healthier food choices not just for their avatars but for their offline selves as well (Sah et al., 2017). Thus, we suggest that the metaverse can mold users' purchase intentions across both the virtual world and the real world (Dwivedi et al., 2023; Hadi et al., 2023).

Prior empirical studies on traditional digital (i.e., website) and physical (i.e., stores) channels have demonstrated purchase intention spillover effects from one channel to another (Beck & Cri , 2018). In the modern retail environment, for example, studies have shown that options such as special glasses and data gloves for accessing 3D retail environments enhance the shopping experience, which supports purchase intentions in the real world (Papagiannidis et al., 2017). Building on these findings, recent conceptual metaverse studies suggest that customers' positive experiences with virtual branded products in metaverse platforms have the potential to spill over into real-world behaviors (Dwivedi et al., 2023; Wongkitrungrueng & Suprawan, 2023). Thus, we propose the following hypothesis:

H5. A positive CXMV enhances virtual-real-world purchase spillovers.

3.3 | Moderating effects of metaverse usage stage

While the theoretical discussions thus far suggest positive and linear relationships between CXMV and the important outcomes, S-D logic also suggests that the nature of the relationships might vary due to different levels of customer involvement in the value "co-production" process (Vargo & Lusch, 2008; p. 8). To this end, the technology adoption literature suggests that the early stage of metaverse platform use, that is, less than 6 months, is crucial for users to acclimate to a new technology environment (Rogers, 2003). The technically enhanced metaverse platforms present unique challenges for users because of their vastness, their immersive and multifaceted nature, and the diverse experiences they offer (Dwivedi et al., 2023). Relatively new users of metaverse platforms often experience a lack of clarity and confidence because they are learning to interact with and understand the intricacies of the new type of virtual world (Dwivedi et al., 2023; Fiske & Taylor, 2017). Consequently, early-stage users of a metaverse platform may not yet have formed a solid basis on which to evaluate their experiences, leading to uncertain perceptions of the platform

and uncertainty in their value-producing activities in metaverse platforms.

Over time, users learn to navigate various interactions within the metaverse, ranging from social engagements to virtual commerce experiences. Thus, customers' understanding of the complex virtual world begins to mature as users spend more time within the metaverse platforms. This process aligns with Piaget's (1954) theory of cognitive development, which emphasizes that individuals construct a more nuanced understanding of their environment over time. In a metaverse platform, this evolution is marked by users transitioning from mere explorers within metaverse platforms to more active participants and more involved value co-creators once they are more familiar with the platform's nuances and intricacies. Subsequently, long-term users become adept at navigating the platform's unique features, such as its virtual economies, digital avatars, and interactive spaces, enhancing their overall experience. This journey from initial curiosity to informed engagement results in a deeper and more stable perception of the platform (Piaget, 1954), which enhances customers' interactions within the platform through increased confidence.

Based on the theoretical premise of users' psychological journey from uncertainty to maturation, and supported by S-D logic premise that customers' involvement in value co-creation might vary, we propose that CXMV's relationship with customers' metaverse usage (H3) and purchase intentions (H4) and virtual-real-world purchase spillovers (H5) are not always linear. For early-stage users, we hypothesize a weaker nonlinear relationship between CXMV and these outcomes. In other words, for these users, the positive influence of CXMV on the outcomes increases at a decreased rate. This may be attributable to the overwhelming nature of a user's early experiences of a metaverse platform, when they are faced with multiple novel stimuli and complex interactions, finding it challenging to translate their experiences into positive outcomes.

However, as users become more accustomed to a metaverse platform and transition into the long-term user stage, the relationship between CXMV and outcomes becomes stronger and nonlinear. Here, the positive influence of CXMV on the outcomes begins to increase at an accelerated rate. This positive shift may be attributable to users' increased familiarity and confidence with the intricacies of the metaverse platform, leading to a more profound utilization of its offerings. To this end, the influence of CXMV on user outcomes follows a complex trajectory that is contingent on the length of CXMV. Thus, the following hypotheses predict a nonlinear relationship between CXMV and user outcomes:

H6a-b. A nonlinear association exists between CXMV and users' intention to use the metaverse such that the association is (a) weaker for early-stage users and (b) stronger for long-term users.

H7a-b. A nonlinear association exists between CXMV and users' purchase intentions such that the association is (a) weaker for early-stage users and (b) stronger for long-term users.

H8a-b. A nonlinear association exists between CXMV and virtual-real-world purchase spillover such that the association is (a) weaker for early-stage users and (b) stronger for long-term users.

Figure 5 illustrates the proposed conceptual framework.

4 | RESEARCH METHODOLOGY

4.1 | Construct measures

While few empirical studies on the metaverse exist at the time of this study, extant studies (e.g., Gahler et al., 2023; Hollebeek et al., 2023; Hsiao & Lin, 2023; Moore et al., 1991; Oh et al., 2023; Rahman, Carlson, Gudergan, et al., 2022) offer guidance on the measurement of the constructs in our conceptual model. To generate empirically valid measures of our constructs, two experienced marketing scholars carefully designed the measurement items based on a seven-point (*agree to disagree*) Likert scale to ensure clarity and precision of participant responses. Next, two research students who were also metaverse users reviewed each item for content validity. After incorporating their feedback, the wording of items was further clarified by a professional copyeditor. To ensure face validity, the items were reviewed by three nonacademic metaverse users, none of whom reported any ambiguity. The final measurement items were reviewed and approved by an ethics committee consisting of scholars with and without a marketing background. Following Rahman, Carlson, Gudergan, et al. (2022), a marker variable with four items was also included to check for common method bias.

Because consumer behaviors in both the real world and the metaverse are influenced by demographic factors (Carlson et al., 2021), we used gender as a control variable to isolate the effect of CXMV on the various outcomes, enhancing the accuracy and generalizability of our results.

4.2 | Data collection and analysis

We collected data from Amazon Mechanical Turk members who were active users of popular metaverse platforms, aged at least 18 years, and residing in the United States. Data collection involved two stages: (i) respondent pool generation and (ii) main data collection. This two-stage process (Sharpe Wessling et al., 2017) was necessary to ensure high data quality (e.g., responses from users with diverse experiences with metaverse platforms). The survey was released in stages over several weeks to ensure data were obtained from diverse respondents in different situations and time zones. Participants received fair compensation for their time and effort.

In the first stage, a screening study was conducted to generate a pool of participants who matched the desired criteria (Aguinis et al., 2021). Participants were asked to indicate whether they had ever used any of the following metaverse platforms (randomized to

Conceptual Framework

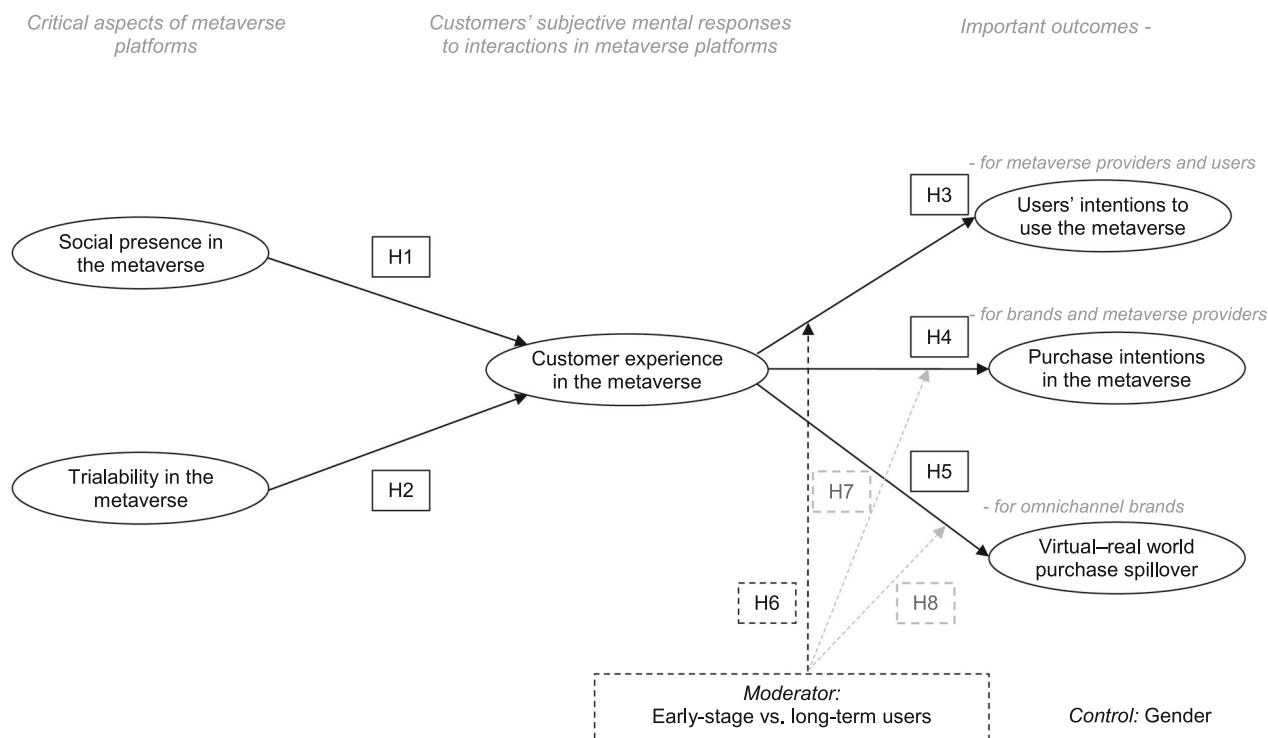


FIGURE 5 Conceptual framework.

minimize selection bias): Upland, Roblox, Sandbox, Decentraland, Horizon Worlds, Star Atlas, Fortnite, Illuvium, Somnium, Voxels, Enjin, NVIDIA, Axie Infinity, Unity, Bloktopia, ZEPETO, or Blankos Block Party. Respondents also had the option to enter the name of a metaverse platform if it was not on the list. Respondents who had previously used a metaverse platform were asked to elaborate on how they engaged with it. The following are some sample responses:

I currently use the platform called Sandbox. It's very useful to me in creating my own games, and we can also create a virtual character in the virtual world through this platform. Not only does it provide entertainment, but we can also sell the virtual character for money. Additionally, it is very secure for our data. Yes, it's Decentraland. The virtual world where we can now buy a piece of land, start to make our casino, a game-playing station like Las Vegas. They can play games, gamble in your casino. This is happening in the metaverse 3D world.

In total, 776 responses were generated by the screening question. After carefully reviewing the qualitative responses, 448 respondents were included in the pool.

For the second stage, the main survey questionnaire was developed using the online survey tool Qualtrics. We followed Rahman, Carlson, Gudergan, et al.'s (2022) recommendations to develop the questionnaire, minimize bias, and generate higher respondent

engagement. For example, the questionnaire included no matrix tables, questions were randomized, and respondents answered one question at a time. To personalize the questions, respondents were asked to think about their recent experiences with a frequently used metaverse platform, the name of which was dynamically inserted into the survey items using the Qualtrics piping function. Following multiple pretests, reviews by experienced marketing researchers with extensive publication experience, and several improvements of the newly developed questionnaire, the Qualtrics survey link was distributed to the prepopulated respondent pool in November and December 2023.

Using the online tool developed by Soper (2023), we applied an a priori sample size calculation to determine the minimum sample size required for the structural equation model before data collection. For an anticipated large ($d = 0.5$) effect size and statistical power level of 0.8, with six latent variables and 23 indicators in the proposed framework (see Table 1), the recommended minimum sample size is 110 at $p \leq 0.5$ (Soper, 2023). Initially, 312 responses were collected, and the data were checked for quality issues (e.g., excessively short completion time or straightlining). Finally, 286 responses (48% female; see Table A.4 for demographic details) were identified as usable, which was higher than the minimum required sample size for estimating the hypothesized model using partial least squares structural equation modeling (PLS-SEM).

We employed PLS-SEM in SmartPLS v. 4.0 (Ringle et al., 2022) software to analyze the hypothesized relationships in our model. This method is ideal for exploratory research such as this study,

which focuses on predicting complex constructs (Hair et al., 2021). The flexibility of PLS-SEM for evaluating measurement and structural models, and its ability for multigroup analysis in complex models, aligned well with our data and research objectives (Hair et al., 2019). We also leveraged the quadratic effect assessment feature in SmartPLS software to rigorously examine nonlinear relationships (SmartPLS, 2023).

5 | DATA ANALYSIS AND HYPOTHESIS TESTING

5.1 | Measurement model assessment

We employed PLS-SEM in SmartPLS (Ringle et al., 2022) software to validate our measurement model (Hair et al., 2021) and confirmatory composite analysis to assess our reflectively measured constructs (Hair et al., 2020).

Each construct was measured using a minimum of three items. Therefore, to validate the measurement model, we estimated indicator loadings, indicator reliabilities, construct reliability, convergent validity (using average variance extracted), and discriminant validity (Hair et al., 2020). Initially, we used Gahler et al.'s (2023) six-dimensional CX measure for our survey; however, exploratory factor analysis (EFA) of our dataset did not empirically support this.⁴ Therefore, following Sample et al. (2024) and Rahman, Carlson, Gudergan, et al. (2022), we validated a six-item measure of CXMV, with each item representing a specific CX dimension. For all constructs, the outer loadings of each indicator were above 0.708 and significant; thus, they were well loaded to their corresponding construct. Next, we checked the squared values of the indicator loadings, with the results showing good indicator reliability. Internal consistency was assessed by checking composite reliability and Cronbach's alpha, the values of which were all above the threshold of 0.70, demonstrating good construct reliability (Hair et al., 2019). Then, we estimated the average variance extracted from all constructs, with values above 0.50 showing convergent validity. Table 1 presents the confirmatory composite analysis results for all constructs. Finally, the discriminant validity of all constructs was confirmed by checking the heterotrait–monotrait ratio of correlations. Values below 0.90 (see Table 2) confirmed discriminant validity.

To confirm that the constructs were indeed reflectively measured, we conducted confirmatory tetrad analysis (Gudergan et al., 2008). The results show that all adjusted tetrad intervals contained zero, confirming that all constructs in the model were measured reflectively. These assessment results confirm the reliability and validity of our measurement model.

⁴First, we conducted an EFA with the extraction method set to Maximum Likelihood (ML), which yielded a three-factor model. Within that EFA result, multiple items had a factor-to-item loading lower than 0.5 and higher cross-loadings. As such, it was necessary to purify the model. Next, to ensure the purified model had adequate coverage for the CX aspects (affective, cognitive, physical, relational, sensorial, and symbolic), the items with the highest loading from each dimension were retained during the iterative EFA process. Finally, a six-items model was achieved with factor reliability (Cronbach's Alpha) > 0.7.

5.2 | Common method bias test

We applied multiple methods to check for common method bias. First, we checked the variance inflation factor (VIF) values for the measurement model in the PLS-SEM outputs, and they were all below 2, which indicates that the dataset did not suffer from collinearity or method bias issues (Kock, 2015). Second, following Rahman, Carlson, Gudergan, et al. (2022), we employed a marker variable method where we included a latent variable that was not conceptually related to the dependent variable in the model. The results show that the correlations between the marker variable and other constructs were all below 0.30, which indicates that the marker variable had no practical or meaningful relationship to any other variable in the research framework (Gkorezis et al., 2016; Tehseen et al., 2017). Overall, these test results indicate that common method bias was unlikely to be a concern in this study.

5.3 | Path model results: Main effects

We used PLS-SEM for the data analysis because our model includes complex nonlinear relationships and multigroup analysis. H1 and H2 posited that social presence and trialability, respectively, would have a direct linear relationship to CXMV. We conducted 10,000 complete bootstraps with random seed sampling setting to estimate standard path coefficients (β), t -values, and confidence intervals. The results show that both social presence ($\beta = .250$, $p = .001$, $t = 3.349$) with (0.104, 0.393) 95% bias-corrected confidence interval (BCa) and trialability ($\beta = .501$, $p < .001$, $t = 8.174$, BCa = 0.383, 0.625) in the metaverse have a significant positive effect on CXMV. No confidence intervals included zero. We further checked the explanatory power of the two independent variables (social presence and trialability). The adjusted R^2 for CXMV was 46.2%, indicating a satisfactory explanatory relevance of the independent variables. The PLSpredict (Shmueli et al., 2016; Shmueli et al., 2019) Q^2 value of CXMV was 0.446, indicating the predictive relevance of social presence and trialability. Therefore, both H1 and H2 were supported.

The direct effect of CXMV on metaverse usage intentions ($\beta = .596$, $p < .001$, $t = 13.491$, BCa = 0.502, 0.674), digital purchase intentions ($\beta = .626$, $p < .001$, $t = 17.432$, BCa = 0.546, 0.687), and virtual–real-world purchase spillovers ($\beta = .541$, $p < .001$, $t = 12.236$, BCa = 0.445, 0.620) were all positive and significant, supporting H3, H4, and H5, respectively. In addition, our cross-validated predictive ability test (CVPAT; Liengard et al., 2021; Sharma et al., 2023) on the model, using 10-fold cross-validation repeated 10 times, revealed that the predictions made using PLS-SEM were significantly better than those from the naive indicator-averages (IA) benchmark for the endogenous constructs. This was evidenced by the average loss differences: CXMV (-0.451 , p -value $< .001$), USIN (-0.291 , p -value $< .001$), PRIN (-0.284 , p -value $< .001$), and SPILL (-0.239 , p -value $< .001$). Table 3 presents the results of the main hypothesis tests.

TABLE 1 Constructs in the measurement model.

Item ID	Construct name, definition, and measurement items	Loading	t-value	α	CR	AVE
Social presence in the metaverse: The degree to which customers perceive avatar-mediated social actors in metaverse platforms as being simulated in vivid sensory or non-sensory ways				0.719	0.826	0.542
SOPR1	I sense that I am interacting with other people rather than a computer simulation in metaverse.	0.754	21.645			
SOPR2	In metaverse, I sometimes feel I am working directly with another person.	0.733	18.117			
SOPR3	I feel that the people in metaverse are aware of my presence.	0.730	19.261			
SOPR4	I feel I am in the presence of another person in metaverse.	0.728	18.094			
Trialability in the metaverse: The ease with which customers can try branded products in metaverse platforms				0.720	0.826	0.544
TRAL1	I can easily test branded products in metaverse.	0.782	31.101			
TRAL2	Trying branded products in metaverse is straightforward.	0.733	19.783			
TRAL3	The options for trying branded products in metaverse are easily accessible to me.	0.724	22.601			
TRAL4	I can easily try branded products in metaverse.	0.708	17.352			
Customer experience in the metaverse: Customers' subjective responses to interactions with others in metaverse platforms				0.809	0.831	0.551
CXMV1	My interactions with others in metaverse positively engage my senses in a variety of ways.	0.748	25.936			
CXMV2	My interactions with others in metaverse induce positive emotions.	0.719	23.839			
CXMV3	I feel positively connected to others in metaverse.	0.709	21.325			
CXMV4	My personal beliefs are confirmed during my interactions with others in metaverse.	0.707	22.608			
CXMV5	I obtain positive insights during my interactions with others in metaverse.	0.705	21.511			
CXMV6	During my interactions with others in metaverse, I feel I can move in a way I like.	0.704	20.319			
Users' intentions to use the metaverse: Customers' intentions to continue using a metaverse platform				0.722	0.844	0.643
USIN1	I intend to use metaverse again.	0.839	37.636			
USIN2	I would consider continuing my use of metaverse.	0.784	29.342			
USIN3	I intend to use metaverse in the future.	0.781	26.578			
Purchase intentions in the metaverse: Customers' intentions to purchase virtual or digital branded products in metaverse platforms				0.710	0.837	0.632
PRIN1	I would make an effort to buy branded products in metaverse.	0.803	23.936			
PRIN2	I am likely to spend money on virtual branded products in metaverse.	0.799	24.754			
PRIN3	I would consider buying branded products in metaverse.	0.783	22.137			
Virtual-real world purchase spillover: Transfer of consumer perceptions and behaviors from virtual product trials in the metaverse to tangible real-world purchasing decisions				0.833	0.888	0.665
SPI1	Experiencing a brand's products in metaverse influences my decision to purchase from that brand in the real world.	0.829	32.132			
SPI2	The experience of trying a brand's products in metaverse continues to influence my engagement with the brand in the real world.	0.825	25.247			
SPI3	The option to try a brand's products in metaverse influences my decision to purchase from that brand in the real world.	0.812	19.261			
SPI4	Trying a brand's products in metaverse influences my decision to purchase from that brand in the real world.	0.795	20.464			

Note: The metaverse placeholder was replaced with the name of the metaverse platform selected by the respondent at the start of the survey to personalize all items. The duration of use of the metaverse platform was captured by the question: How long have you been using metaverse? (a) Less than 1 month, (b) 1–3 months, (c) 4–6 months, (d) 7–12 months, (e) About 2 years, or (f) More than 2 years. The results were estimated using SmartPLS software.

TABLE 2 Discriminant validity of model (Heterotrait–Monotrait ratio).

Construct	Social presence in the metaverse	Trialability in the metaverse	Customer experience in the metaverse	Users' intention to use the metaverse	Purchase intentions in the metaverse	Virtual–real world purchase spillover
Social presence in the metaverse	–					
Trialability in the metaverse	0.773					
Customer experience in the metaverse	0.700	0.846				
Users' intention to use the metaverse	0.599	0.753	0.776			
Purchase intentions in the metaverse	0.581	0.747	0.821	0.723		
Virtual–real world purchase spillover	0.600	0.585	0.654	0.510	0.763	–

TABLE 3 Partial least square results for the main hypotheses.

Hypothesis/path	β	SD	t (β /SD)	p	97.5% CI	R ² _{Adjusted}	Outcome
H1 SOPR → CXMV	0.250	0.075	3.349	0.001	[.133, .405]	0.462	Supported
H2 TRAL → CXMV	0.501	0.062	8.174	0.000	[.374, .619]	0.462	Supported
H3 CXMV → USIN	0.596	0.044	13.491	0.000	[.504, .677]	0.355	Supported
H4 CXMV → PRIN	0.626	0.036	17.432	0.000	[.550, .690]	0.392	Supported
H5 CXMV → SPIL	0.541	0.044	12.236	0.000	[.453, .625]	0.293	Supported

Note: Two-tailed significance level at 5%.

Abbreviations: CXMV, customer experience in the metaverse; PRIN, purchase intentions in the metaverse; SOPR, social presence in the metaverse; SPIL, virtual–real world purchase intention spillover; TRAL, trialability in the metaverse; USIN, users' intentions to use the metaverse.

TABLE 4 Mediation analysis.

Relationship	Direct effect				Indirect effect (mediator: CXMV)			
	Effect size	95% CI	t	p	Effect size	95% CI	t	p
SOPR → USIN	0.097	[–0.012, 0.231]	1.547	.122	0.098	[0.039, 0.182]	2.648	.008
SOPR → PRIN	0.052	[–0.103, 0.221]	0.644	.520	0.109	[0.040, 0.205]	2.569	.010
SOPR → SPIL	0.263	[0.036, 0.562]	1.931	.054	0.108	[0.042, 0.193]	2.752	.006
TRAL → USIN	0.278	[0.116, 0.443]	3.304	.184	0.233	[0.141, 0.330]	4.848	.000
TRAL → PRIN	0.222	[0.089, 0.353]	3.271	.001	0.257	[0.125, 0.418]	3.387	.001
TRAL → SPIL	0.157	[–0.069, 0.397]	1.329	.184	0.256	[0.105, 0.445]	2.919	.004

Note: Two-tailed significance level at 5%.

Abbreviations: CXMV, customer experience in the metaverse; PRIN, purchase intentions in the metaverse; SOPR, social presence in the metaverse; SPIL, virtual–real world purchase intention spillover; TRAL, trialability in the metaverse; USIN, users' intentions to use the metaverse.

5.4 | Mediation analysis

To obtain further insights, we estimated whether the indirect paths mediated by CXMV were significant. First, we assessed the indirect effect of social presence on metaverse usage intentions, users' digital

purchase intentions, and virtual–real-world purchase spillovers via CXMV. The results in Table 4 show that the indirect effect of social presence on metaverse usage intentions ($\beta = .098$, 95% CI [0.039, 0.182]) and users' digital purchase intentions ($\beta = .109$, CI [0.040, 0.205]) when CXMV was included as a mediator were both significant.

TABLE 5 Multigroup invariance results.

Construct	Multigroup sample correlation		Multigroup sample mean			Multigroup sample variance		
	Permutation mean	5.0%	Permutation mean difference	2.5%	97.5%	Permutation mean difference	2.5%	97.5%
Social presence in the metaverse	0.994	0.985	-0.001	-0.159	0.168	-0.008	-0.585	0.526
Trialability in the metaverse	0.996	0.990	0.002	-0.152	0.151	-0.019	-0.388	0.363
Customer experience in the metaverse	0.999	0.997	0.001	-0.146	0.146	-0.015	-0.356	0.311
User intentions to use the metaverse	0.997	0.992	0.002	-0.181	0.172	-0.016	-0.416	0.361
Purchase intentions in the metaverse	0.997	0.993	0.003	-0.154	0.163	-0.030	-0.577	0.625
Virtual-real world purchase intention spillover	0.998	0.994	0.006	-0.192	0.207	-0.047	-0.779	0.621

TABLE 6 Multigroup analysis of nonlinear effects.

Path	Path coefficient (β)	t	97.5% CI	p	f ²	Outcome
<i>Outcome: Metaverse usage intentions</i>						
Group: Early-stage users						
CXMV → USIN	0.615	9.466	[.470, .725]	.000	0.651	H6a supported
CXMV → USIN (quadratic)	-0.137	2.362	[-.247, -.022]	.018	0.047	
Group: Long-term users						
CXMV → USIN	0.586	9.731	[.464, .703]	.000	0.396	H6b supported
CXMV → USIN (quadratic)	0.106	2.330	[.008, .188]	.002	0.028	
<i>Outcome: Purchase intentions in the metaverse</i>						
Group: Early-stage users						
CXMV → PRIN	0.697	14.203	[.593, .786]	.000	0.878	H7a not supported
CXMV → PRIN (quadratic)	-0.003	0.065	[-.105, .098]	.948	0.000	
Group: Long-term users						
CXMV → PRIN	0.511	8.270	[.399, .641]	.000	0.328	H7b not supported
CXMV → PRIN (quadratic)	-0.100	1.013	[-.238, .108]	.311	0.027	
<i>Outcome: Virtual-real world purchase spillover</i>						
Group: Early-stage users						
CXMV → SPIL	0.481	6.624	[.338, .617]	0.000	0.274	H8a not supported
CXMV → SPIL (quadratic)	0.118	1.685	[-.013, .260]	0.092	0.024	
Group: Long-term users						
CXMV → SPIL	0.516	8.725	[.411, .642]	0.000	0.340	H8b not supported
CXMV → SPIL (quadratic)	-0.107	1.143	[-.243, .089]	0.253	0.032	

Note: Two-tailed significance level at 5%.

Abbreviations: CXMV, customer experience in the metaverse; PRIN, purchase intentions in the metaverse; SPIL, virtual-real world purchase intention spillover; USIN, users' intentions to use the metaverse.

However, the direct effects of social presence on metaverse usage intentions ($\beta = .097$, CI [-0.012, 0.231]) and customers' purchase intentions ($\beta = .052$, CI [-0.103, 0.221]) were nonsignificant. These results indicate a full mediation relationship. In contrast, both the direct relationship ($\beta = .263$, CI [0.036, 0.562]) and the indirect

relationship via CXMV ($\beta = .108$, CI [0.042, 0.193]) between social presence and virtual-real-world purchase spillover were significant, indicating a partial mediation relationship.

Following the same procedure, we then tested the indirect effect of trialability on metaverse usage intentions, customers' purchase

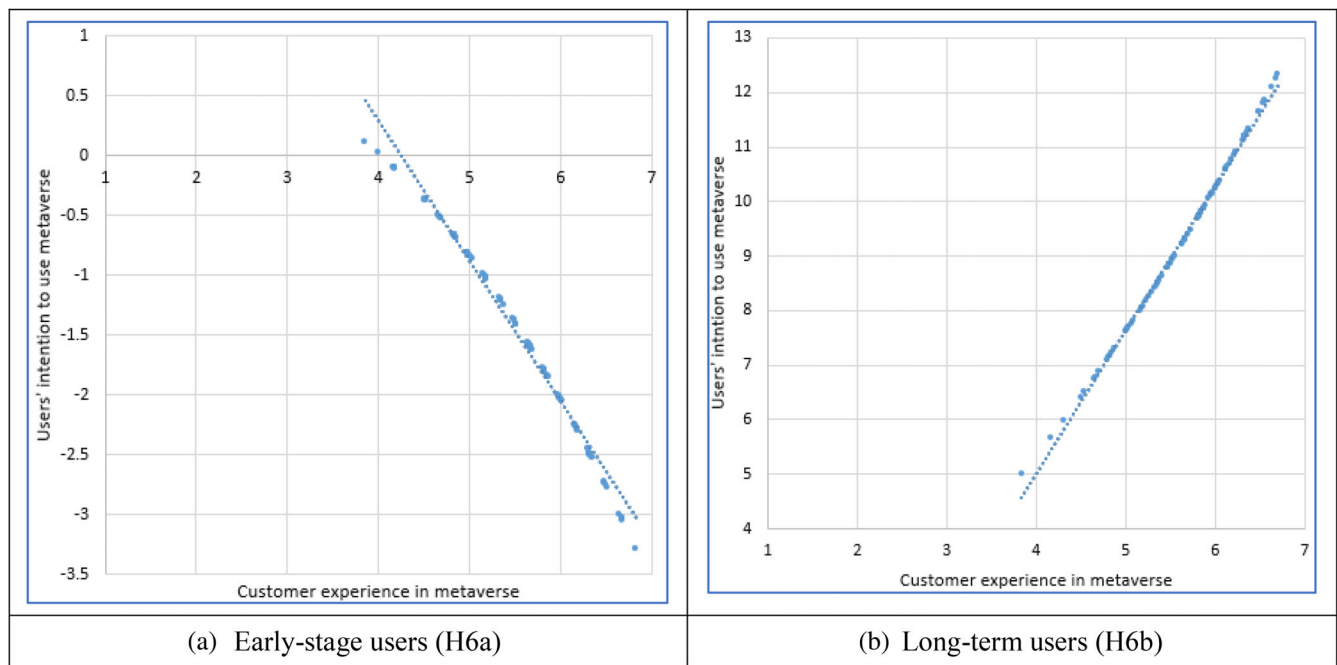


FIGURE 6 Nonlinear relationship between customer experience and metaverse usage intentions. This figure shows a negative deviation from the linear line (negative nonlinearity) for early-stage users and a positive deviation from the linear line (positive linearity) for long-term users. Interestingly, the positive deviation begins at a high level of customer experience (6–7 on the x-axis), meaning that metaverse platforms must deliver an excellent CX to achieve positive nonlinearity and that metaverse usage intentions will not plateau; therefore, managers can confidently continue investing in relevant strategies.

intentions, and virtual–real-world purchase spillover. The results in Table 4 indicate a partial mediation relationship between trialability and customers' purchase intentions in the metaverse via CXMV and full mediation relationships between trialability and metaverse usage intentions and virtual–real-world purchase spillover via CXMV. The implications of this are discussed in Section 6.

5.5 | Path model results: Multigroup analysis

H6, H7, and H8 posited that the relationships between CXMV and each of the three dependent variables (metaverse usage intentions, customers' purchase intentions, and purchase spillover effects, respectively) would differ depending on user experience with a metaverse platform (i.e., early-stage vs. long-term use). To test these hypotheses, we applied multigroup analysis using SmartPLS. A requirement for multigroup analysis is to test invariance in the correlations, means, and variances between the two groups. Table 5 presents the results for the measurement invariance of composite models, indicating no significant difference between the composite models for both groups (early-stage users: $n = 105$; long-term users: $n = 181$) and establishing compositional invariance. Next, using bootstrap multigroup analysis in SmartPLS, the PLS-MGA ($p = .002$) and Welch-Satterthwait ($p = .001$) test outcomes were checked. The estimates indicated a significant difference in path coefficients between CXMV's quadratic effect on the outcome variable Usage Intention. Hence, we proceeded to test H6–H8.

H6a and H6b hypothesized a nonlinear relationship between CXMV and metaverse usage intentions such that the relationship is weaker for early-stage users (H6a) and stronger for long-term users (H6b). The results in Table 6 indicate that for early-stage users, there was a negative and significant quadratic effect between CXMV and metaverse usage intentions ($\beta = -0.137$, $p = .018$, $f^2 = 0.047$, 95% CI $[-0.247, -0.022]$). In contrast, for long-term users, the quadratic relationship between CXMV and metaverse usage intentions ($\beta = .106$; $p = .002$, $f^2 = .028$, 95% CI $[0.008, 0.188]$) was positive and significant. Figure 6 shows the decreasing effect of CXMV on metaverse usage intentions for early-stage users and an increasing effect of CXMV on metaverse usage intentions for long-term users. Thus, both H6a and H6b are supported.

H7 and H8 posited differences in the effects of CXMV on customer purchase intentions and purchase spillover effects, respectively, according to user experience with the metaverse. However, the results in Table 6 show that while the linear relationships are positive and significant for all groups, the quadratic relationships are nonsignificant. Therefore, H7 and H8 are not supported.

5.6 | Post-hoc analysis

Next, we performed two post-hoc tests, necessary condition analysis (NCA) (Dul, 2016; Richter et al., 2023; Richter & Hauff, 2022) and importance-performance matrix analysis (IPMA) (Hair et al., 2024; Ringle & Sarstedt, 2016), to reveal further

TABLE 7 Necessary condition analysis: effect sizes and significance of social presence and trialability on customer experience.

Construct	Customer experience in the metaverse	p-value
Social presence in the metaverse	0.088	.594
Trialability in the metaverse	0.248	.000

Note: Social presence in the metaverse is a minor ($d < 0.1$) and nonsignificant ($p > 0.05$) necessary condition, while trialability is a meaningful ($d \geq 0.1$) and significant ($p < 0.05$) necessary condition for a positive customer experience.

TABLE 8 Bottleneck table: Level of social presence and trialability required for a positive customer experience in the metaverse.

Outcome		Conditions (percentiles)	
Steps	CXMV	Social presence in the metaverse	Trialability in the metaverse
0.00%	3.835	NN	NN
10.00%	4.135	NN	NN
20.00%	4.434	NN	NN
30.00%	4.734	NN	4.282
40.00%	5.034	NN	4.282
50.00%	5.333	NN	4.282
60.00%	5.633	NN	4.282
70.00%	5.933	NN	4.282
80.00%	6.232	NN	5.024
90.00%	6.532	4.796	5.485
100.00%	6.832	4.796	6.252

Note: Following Richter et al. (2020), we divided the outcome into 10% steps from 0% to 100% and evaluated the level of conditions required for each step. To obtain a 90% (i.e., 6.5 in an agree-disagree Likert scale of 1–7) customer experience in the metaverse (CXMV), a minimum social presence of around 4.8 in a 7-point scale, and a minimum trialability of around 5.5 in a 7-point scale are necessary.

Abbreviations: NN, not necessary.

TABLE 9 Importance matrix of social presence and trialability in the metaverse.

Construct	Customer experience in the metaverse	Users' intentions to use the metaverse	Purchase intentions in the metaverse	Virtual-real world purchase spillover
Social presence in the metaverse	0.250	0.149	0.157	0.135
Trialability in the metaverse	0.507	0.302	0.317	0.275
Customer experience in the metaverse	–	0.596	0.626	0.541

Note: The estimates show the total effect of the constructs on the outcomes using the full dataset; higher total effect = more important.

Construct	Customer experience in the metaverse		Metaverse usage intentions	
	Early-stage users	Long-term users	Early-stage users	Long-term users
Social presence in the metaverse	0.316	.182	0.209	0.093
Trialability in the metaverse	0.523	.479	0.352	0.248

Note: The group specific IPMA results are presented only for the outcome “Metaverse usage intentions” because hypotheses H6a and H6b are supported in this study, but H7a, H7b, H8a, and H8b are not supported.

insights. NCA identifies the variable(s)/construct(s) in a model that act as critical (necessary) factors for achieving the desired outcome(s). In other words, NCA reveals variables and their levels (i.e., bottleneck) without which the outcome(s) will not occur. NCA

can also aid the validation of the necessity of mediating variable(s) in a structural equation model. IPMA can be used independently; however, IPMA can complement the NCA estimates by revealing the relative importance of a necessary variable for the outcomes.

For instance, from a managerial perspective, a variable with a significant necessary condition and higher importance is critical for achieving a higher level of outcome performance, potentially generating a competitive advantage. Moreover, from a theoretical perspective, studies should further advance research on understanding the application of that variable.

5.6.1 | Necessary condition analysis (NCA)

First, we assessed the necessity of CXMV for the outcomes to occur. To assess effect size and significance of the necessary conditions, we ran 10,000 permutations at a significance level of 0.05. The results reveal that CXMV is a significant must-have component for users' intention to use the metaverse ($d = 0.100$ at $p < 0.05$), purchase intentions in the metaverse ($d = 0.144$ at $p < 0.05$), and virtual-real-world purchase spillover ($d = 0.113$ at $p < 0.05$) to occur. These outcomes offer further empirical validation for CXMV's mediating role in the study's research framework. Next, we performed additional NCA to determine whether social presence and trialability are necessary conditions for CXMV. We found that social presence is a minor ($d = 0.088$) but nonsignificant ($p > 0.05$) necessary condition for CXMV, while trialability is a meaningful ($d = 0.248$) and significant ($p < 0.05$) necessary condition for CXMV (see Table 7). This outcome empirically establishes that while both social presence and trialability are desirable for generating a positive CXMV, the latter is a must-have component. Each necessary condition was then further assessed against a bottleneck table to specify the minimum level that must be attained to achieve the outcome. Table 8 shows that to achieve 90% of CXMV (i.e., 6.5 on an agree-disagree Likert scale of 1 to 7), a minimum social presence of around 4.8 (7-point scale) and a minimum trialability of around 5.5 (7-point scale) are necessary.

5.6.2 | Importance-performance matrix analysis (IPMA)

Further, we conducted IPMA to identify the most influential determinant of the outcome variables (metaverse usage intentions, customer purchase intentions, and virtual-real-world purchase spillover). The results in Table 9 indicate that trialability is the most important condition for all outcomes, with effect sizes of 0.507 for CXMV, 0.302 for users' intentions to use the metaverse, 0.317 for purchase intentions in the metaverse, and 0.275 for virtual-real-world purchase spillover. Further, because H6a and H6b are supported in this study, we also assessed the group-specific IPMA for the supported hypotheses. To this end, as reported in Table 9, social presence in the metaverse is more important to early-stage users in terms of customer experience in the metaverse (0.316) and metaverse usage intentions (0.209). The estimates also show that the importance of trialability in the metaverse for customer experience in the metaverse and metaverse usage intentions is constantly high across the groups of early-stage and long-term users.

6 | DISCUSSION AND CONCLUSION

This study achieves four important objectives. First, it responds to the call for a new theoretical model of CXMV (Dwivedi et al., 2022; Hadi et al., 2023), providing a comprehensive theoretical basis for examining experience in this new channel. Second, it identifies two important determinants of positive CXMV: social presence and trialability. Third, it examines how CXMV affects customers' intentions to continue using the metaverse. It also examines how positive CXMV shapes purchase intentions of digital products in the metaverse. Fourth, it demonstrates the potential for virtual to real-world purchase spillovers, extending the omnichannel retail literature. Fifth, the use of rigorous multigroup linearity testing demonstrated that the effect of CXMV on metaverse usage intentions varies according to user experience in the metaverse. Finally, this research offers specific, actionable insights into customers' metaverse retail experiences for metaverse platform providers and retailers.

6.1 | Theoretical implications

While customer experience has been extensively researched in a range of settings, including tourism (Godovykh & Tasci, 2020; Mehmetoglu & Engen, 2011), banking (Fernandes & Pinto, 2019; Kumar & Balamachandran, 2018), retail (Banik & Gao, 2023; Grewal & Roggeveen, 2020; Pizzi et al., 2019), and virtual platforms (Beck & Crié, 2018; Flavián et al., 2019; Tussyadiah et al., 2018), its role in the metaverse has not yet been examined (Dwivedi et al., 2022; Hadi et al., 2023; Richter & Richter, 2023). The unique characteristics of the metaverse, including its interactivity, immersiveness, interoperability, sociability, and avatar co-location (Bogicevic et al., 2019; Choi et al., 2023; Gadalla et al., 2013; Hennig-Thurau et al., 2023; Hwang & Lee, 2022; Jiang et al., 2023; Pizzi et al., 2020), all influence customers' metaverse shopping experiences. Therefore, this study contributes to both the services and the metaverse literature.

First, we address a key question pertaining to how CXMV operates in the novel setting of the metaverse (Gahler et al., 2023). Using S-D logic as the foundation of our model, we explored customers' perceptions of their metaverse retail experiences. From the consumer perspective, interactions with brands, other consumers, and the metaverse platform generate a holistic experience (Chen & Yang, 2021). This study is the first to operationalize measurement items for CXMV, thus guiding future scholarly endeavors in this domain. It is also the first study to examine how CXMV mediates consumer behaviors within the metaverse. We empirically demonstrate that CXMV mediates the relationship between our novel antecedents (social presence and trialability) and brand-related outcomes, including customers' intentions to continue using the channel and their purchase intentions both within and outside of the metaverse.

In a second important theoretical contribution, through rigorous multigroup quadratic empirical testing, we confirm that CXMV has different effects depending on whether the user is relatively new or

more experienced. We found that early-stage users of the metaverse have lower CXMV expectations; thus, their CXMV has a weaker effect on their intention to use the metaverse platform in the future. In contrast, longer-term users have higher CXMV expectations, positively influencing their future platform usage intentions. This study is the first to empirically demonstrate the nonlinear effects of CXMV optimization on outcomes such as customers' metaverse usage intentions. That is, the higher the CXMV delivered, the higher the positive nonlinearity for long-term users.

This theoretical finding contributes significantly to the application of S-D logic by illustrating the alignment of value co-creation in the metaverse. In the metaverse, value is created not only by the metaverse platform provider or the brand but also by customers collaborating with others through immersive experiences and interactions. Indeed, customers who are more familiar with the metaverse may experience enhanced value co-creation given their higher CXMV expectations. The findings suggest that the conceptualization of S-D logic should be expanded to incorporate virtual experiences and their effects on customer behaviors and engagement in emerging digital channels such as metaverse platforms. Further, we enrich the application of S-D logic by providing empirical evidence from a novel digital environment, suggesting the need to consider virtual contexts in the application of this theory. This theoretical contribution may also assist future researchers in conceptualizing other constructs and frameworks in the metaverse context utilizing S-D logic as the theoretical lens.

In a third theoretical contribution, we examined two new antecedents to CXMV, namely social presence and trialability. Previous studies in the brick-and-mortar and bricks-and-clicks retail settings have found that social presence enhances customer trust and rapport (Argo et al., 2005; Jiang et al., 2022; Ogonowski et al., 2014). In CMC environments, social presence is influenced by avatars' humanlike voices (J. Kim et al., 2022; Stein, 2022) and mediated touch in the form of haptic feedback (Wedel et al., 2020). However, how the social presence of avatars and brands facilitates CXMV has not previously been examined. Our finding that social presence is a desired condition for generating a positive CXMV contributes significantly to the theoretical understanding of customer behaviors in CMC environments. This illustrates how customers' perceived avatar-mediated social identities in metaverse platforms facilitate connections between metaverse actors and, in turn, a positive and engaging CXMV.

In addition, we extend the omnichannel retailing literature by examining the role of trialability in the metaverse as a novel construct. Trialability is a distinct characteristic of virtual and immersive channels that, to date, has received limited attention (Dwivedi et al., 2023; Spajić et al., 2022). Our findings extend the literature on the role of trialability as a key determinant of CXMV. Given that CXMV is a multifaceted concept encompassing multiple touchpoints, stimuli, and customer journeys (Becker & Jaakkola, 2020; Lemon & Verhoef, 2016; Pine & Gilmore, 1998), understanding the unique ability of the metaverse to offer interactive 3D experiences with branded products and how this enhances CXMV is an important theoretical objective (Bhatnagar, 2023; Dwivedi et al., 2023; Shams et al., 2023;

Spajić et al., 2022). We found that trialability is the most important antecedent and is a necessary condition for positive CXMV. Along with customers having an adequate opportunity to experience social presence with other metaverse actors, an optimal level of trialability was found to deliver a high-level CXMV.

Our fourth major theoretical contribution is that, interestingly, trialability also boosts customers' purchase intentions in both the metaverse and the real world. Therefore, our findings demonstrate that allowing customers to trial digital products in the metaverse has a significant spillover effect on customers' purchases of brands in other online and brick-and-mortar retail settings. This novel theoretical finding extends the omnichannel retailing literature, which to date has been limited to exploring purchase intentions in single channels, thus ignoring the fact that omnichannel retailing is complex and CXMV is influenced by multiple touchpoints, both physical and digital. This finding also builds on the prior omnichannel retailing literature that suggests that customers are channel agnostic, confirming Rahman, Carlson, Gudergan, et al.'s (2022) assertion that "omnichannel retailing empowers customers with expanded information and decision-making tools" (p. 614).

6.2 | Managerial implications

This study has several implications for metaverse platforms and retail brands. First, a "one size fits all" approach might not yield higher growth in the metaverse. Rather, managers should adopt a tailored approach to managing CXMV. This tailored approach involves identifying key metaverse user segments (early-stage vs long-term) and strategizing CXMV for each segment to achieve higher CXMV and, subsequently, platform growth and brand success. The measure applied for capturing users' stages, early (up to 6 months) vs long-term (more than 6 months), in this study is based on the length of time a user has been interacting with a metaverse platform. In practice, managers can easily see when a user has registered to use a metaverse platform and the length of time that has elapsed since the registration. Therefore, the segmentation technique operationalized in this study is easily applicable and measurable.

Second, the relationship between CXMV and customer purchase intentions underscores the importance of employing innovative engagement strategies. Our findings demonstrate that a spillover effect exists from repeated interactions within the metaverse environment to customers' real-world purchase behaviors such that their virtual engagements influence their brick-and-mortar purchase behaviors. This finding was especially pronounced for long-term users of the metaverse; thus, it is critical for managers to offer immersive experiences that harness the unique aspects of social presence and trialability for both customers who are new to metaverse platforms as well as repeat users of these platforms. Since new and existing metaverse customers have differing levels of familiarity and engagement with the brands they encounter within the platform, tailoring the CXMV for both customer bases will support a deeper connection with these groups, which will, in turn, increase the potential for real-world purchases.

Third, by understanding how differing levels of social presence and trialability affect customer behaviors in the metaverse, management may be able to more accurately predict customers' future purchase behaviors and adapt their strategies accordingly. In order to improve the CXMV, brands could consider using AI and machine learning to tailor their marketing messaging and product offerings in real-time (Jain et al., 2024). Virtual assistants, for example, could support the customers' preferences, thus enriching the customers' journeys across both the virtual environment and the real world.

Fourth, our mediation analysis (Table 4) suggests that social presence and trialability of products are critical in supporting an excellent CXMV and in reinforcing customers' continued intentions to use their chosen metaverse platform, purchase digital products in the metaverse, and also purchase products in the real world. CXMV within the metaverse context in this sense plays an indispensable role in producing valuable outcomes for both brands and customers. Most importantly, our findings suggest that enabling customers to trial products in the metaverse is essential to enhancing CXMV and achieving spillover of purchases from the metaverse to traditional retail channels.

Lastly, given the dynamic nature of the metaverse and its evolving technologies, managers could seek to enhance social presence and trialability through the development of unique virtual campaigns designed to foster customer interactivity and engagement, as well as through a long-term commitment to innovating the brands' "virtual signature" and presence in the metaverse. This would encourage repeat visitation, brand engagement, and co-creation of value, and in doing so, it would strengthen the customer-brand relationship across both the virtual and real world, which would support profitability.

6.3 | Limitations and future research

This study addresses CXMV and purchase intentions in the metaverse. Our model offers an effective means of assessing customers' overall evaluations of their CXMV in the metaverse retailing context. While the findings advance our understanding of this field, ongoing challenges related to the nascent state of the metaverse, the diversity of platforms, and the conceptualization and measurement of constructs underscore the need for ongoing research in the dynamic field of technology-mediated communications.

This study has a number of limitations. Firstly, due to the rapidly evolving nature of the metaverse platforms, technology, and applications, it is recognized that these developments might outpace the study's findings. This provides an opportunity for future empirical studies to continue to advance this field of research, particularly regarding the measurement of CXMV, its attributes, and the salience of those elements in shaping customer behaviors. For example, services marketing literature focuses on the context in which experiences arise and develops CX measurement tools for capturing specific aspects/dimensions of CX that are critical for service design (Lemon & Verhoef, 2016), such as the OCX measurement model for consumer goods omnichannel retailing (Rahman, Carlson, Gudergan, et al., 2022). While the CXMV construct tested in this study,

underpinned by the theory of the conscious mind (see Gahler et al., 2023), offers a mechanism for assessing CX, it does not offer details about the specific attributes of metaverse CX. Perhaps a more robust attribute-based measurement of metaverse CX can be developed, which could offer metaverse CX design guidance and measurement at a more granular level.

In addition, the current constructs require consideration in future studies. For example, Oh et al. (2018) emphasized that the benefits of increased social presence may not universally lead to positive outcomes. Individual characteristics, such as social anxiety or stress within a virtual environment, suggest that heightened social presence may not be beneficial to all customer segments. Additional research is required to identify the key motivations for successful retailing and branding in the metaverse. Moreover, the desirability of social presence may vary with the interaction context and individual attitudes toward social actors, challenging the notion that more social presence is inherently better. Furthermore, recent retail literature has highlighted the importance of safety perceptions across customer journey stages in an omnichannel environment (Rahman, Carlson, & Chowdhury, 2022). Therefore, future metaverse studies should investigate the interplay of CXMV and other important consumer-focused constructs, such as users' image perceptions in avatar-mediated social settings, customers' safety perceptions in complex metaverse ecosystems, and consumers' well-being perceptions.

Given that trialability was identified as a key determinant of CXMV and other brand-related outcomes, research is required to better understand the extent of trialability that consumers are seeking in their metaverse experience. For instance, customer interest in trialability as well as the nature of the trial experience are likely to vary by product, brand, and/or service category. Future research is required to examine how an optimal trial experience can be generated, as well as the attributes that customers seek from a metaverse-based trial experience.

Finally, future research is required to better examine the complex relationships between various factors that influence the CXMV, including the role of immersive technologies, contextual variations in metaverse platforms, and the role of psychological dispositions, especially regarding avatar-consumer identity. As the metaverse and its technologies are still evolving, avatar-consumer congruity may be variable across different platforms. It is thus worth examining how avatar-customer congruency (Gabisch, 2011) moderates the CXMV, brand perceptions, and customers' behavioral responses. Furthermore, the potential impact of NFT ownership and trading on CXMV is worth exploring, particularly as more luxury brands offer NFTs as a means of enhancing customer loyalty (Yoo et al., 2023). For example, future studies can investigate the motivational factors that drive higher customer engagement with luxury brands (Aldhamiri et al., 2024) in metaverse platforms (Khelladi et al., 2023).

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DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available on request from the corresponding author. The data are not publicly available due to privacy or ethical restrictions.

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APPENDIX A

TABLE A1 Summary of studies on customer experience in metaverse platforms.

Study	Objective	Key findings	Relevance to the current study
Gadalla et al. (2013)	Identifies metaverse retailing service quality determinants and provides a practical framework for retailers and academics in the evolving landscape of Web 3.0.	There are four essential factors that determine the quality of metaverse services: human interaction, emotional expression, virtual simulation, and fantasy offerings.	In the metaverse, users navigate virtual stores through personalized avatars, engaging in synchronous interactions akin to offline customer experience. This unique platform fosters customer cocreation, self-expression, and social interaction, offering retailers valuable opportunities to enhance customer experience and stimulate positive word of mouth.
Ahn et al. (2022)	Provides conceptual clarity to guide future research for advertising scholars.	Proposes a bifold triadic relationship model incorporating media, personal, and engagement factors to guide future advertising research in the metaverse.	The interaction and experiences within the metaverse extend beyond exploring the metaverse's impact on sectors like marketing, society, and individual experiences, addressing issues of trust, privacy, bias, disinformation, legal aspects, and psychological effects. The virtual worlds customer experience generated by different brands in the metaverse significantly affects brand preferences and purchasing decisions in the real world.
Carey (2022)	Conducts a quantitative literature review and showcases the customized customer experience through engagement tools in immersive virtual worlds.	New tech like generated images improves online shopping by influencing consumer habits. Augmented reality helps with product customization, engaging customers. Cutting-edge tools are critical for seamless virtual shopping.	Various advanced technological tools, including customer location tracking tools and augmented reality, are integrated to enhance immersive customer experience in the metaverse, fostering brand engagement throughout the customer journey.
Dwivedi et al. (2022)	Explores the metaverse's impact on marketing, society, and individual experiences, addressing trust, privacy, bias, disinformation, legal aspects, and psychological effects.	Provides a comprehensive conceptualization of the use cases, features, and enabling technologies of the metaverse, incorporating real-world scenarios like mirror worlds, virtual worlds, lifelogging, and augmented reality, each emphasizing distinct functions. Additionally, highlights valuable research directions across diverse domains in the metaverse context.	The innovative CXMV delivers customers immersive encounters that mirror reality and generate experiences unattainable in the physical world. It integrates diverse media like meetings and social networks, fostering collaboration and sharing. Embodied co-experience in the metaverse ensures a significantly sensorial rich engagement.
Golf-Papez et al. (2022)	Analyzes the potentials and challenges associated with falsity within the metaverse to offer strategic business insights.	Explains customer experience in the metaverse as synthetic customer experience. Customers need help to differentiate between natural and technologically simulated experiences. Offers directions for managers to embrace the new nature of falsity synthetic customer experience in the metaverse.	The virtual try-on options allow customers to evaluate products or services without visiting a physical store, creating a seamless, unified customer experience in the metaverse. This experience enhances cognitive, emotional, behavioral, sensorial, and social responses for customers.

(Continues)

TABLE A1 (Continued)

Study	Objective	Key findings	Relevance to the current study
Shin (2022)	Analyzes how users' experiences inform affordances in metaverse games, using mixed methods and affordance theory.	Players in the metaverse select and shape features, affecting their sensory experiences. Social presence is crucial for a positive customer experience.	The metaverse's immersive and social presence features can impact customers' emotional and cognitive responses, contributing to both affective and cognitive aspects of the customer experience. This ultimately promotes users' intention to use the metaverse.
Arya et al. (2024)	Examines the empirical impact of gamified marketing activities on consumer-based brand equity for non-fungible tokens in the metaverse.	Explores the concept of intangible products (NFT), where touch and feeling are redefined through virtual assets mediated by technology.	The gamified marketing activities by brands, enabling sensorial experiences for customers with intangible products as a substitute for physical products in the metaverse, create a novel customer experience. Additionally, customers can virtually trial the intangible products through gamification, resulting in affective, symbolic, and relational customer experience. Consequently, this acquired customer experience promotes purchase intention.
Buhalis, Lin, et al. (2023)	Explores the metaverse's impact on hospitality and tourism, specifically exploring opportunities, challenges, and the potential transformation of customer experience and value cocreation.	CXMV blends physical and virtual worlds. Service providers and customers cocreate it during prepurchase, purchase, and post-purchase stages.	The metaverse is transforming the customer experience by integrating the physical and virtual worlds, making it easier for customers to cocreate throughout their journey. Customers are able to enjoy immersive experiences, which creates a strong sense of presence. Additionally, the trialability feature enables businesses to provide previews, create touchpoints, and prepare users for real-life experiences.
Buhalis, Leung, et al. (2023)	Reviews scholarly works, media articles, and industry reports to define the metaverse ecosystem's impact on tourism experiences.	The metaverse can impact the customer experience before, during, and after the purchase of tourism activities. Furthermore, it can provide virtual alternatives that replace certain physical tourism experiences within the metaverse.	The metaverse allows customers to cocreate value and experiences, trial products virtually, and even replace the real product with its digital twin. This can influence purchase decisions and intentions.
Du et al. (2023)	Proposing a comprehensive metaverse system design framework centered on Quality of Experience (QoE) that integrates technical aspects, consumer utility, and profitability for metaverse service providers.	Unveils a comprehensive optimization strategy considering metaverse system design, consumer satisfaction, and metaverse service providers' profitability at a macro level. At a micro level, we propose adopting Willingness-to-Pay (WTP) as a practical metric for future metaverse system assessments.	The quality of customer experience in the metaverse depends on media attributes, quality, and egocentric designs. These factors produce behavioral responses such as purchase, subscription, and word of mouth. Additionally, they influence attitude responses, such as brand loyalty to the service provider.
Dwivedi et al. (2023)	Explores marketing implications of metaverse adoption for research and policy.	Offers valuable insights and a future research agenda for marketing in the metaverse. Develops a framework for understanding how sensory experiences shape customer experience in the metaverse and provides a sociometrical perspective on metaverse marketing.	Consumers can engage with brands and other customers through interactive channels. Tracking real-time physiological responses provides data to tailor offerings. The personalized metaverse experience turns shopping into an adventure, enabling consumers to purchase virtual products and outfits for

TABLE A1 (Continued)

Study	Objective	Key findings	Relevance to the current study
			themselves and their avatars. This enhances the overall customer experience.
Giang Barrera and Shah (2023)	Reviews the interdisciplinary metaverse by integrating industry insights to investigate its impact on marketing and research.	Highlights the metaverse landscape's technological foundations in marketing. It provides an organizing framework and envisions unique customer experience, bridging gaps and extending insights beyond past study limitations. It also offers insights and raises questions for a future research agenda.	The metaverse offers an immersive customer experience through various interface devices with different levels of reality, sociability, and telepresence. Brands can influence consumers' physical, social, emotional, and cognitive states during metaverse interactions, thus creating unique responses.
Hadi et al. (2023)	Provides a multidisciplinary viewpoint on the metaverse, with a specific focus on exploring its potential implications for consumer behavior.	The metaverse has five key elements: digital mediation, spatiality, immersion, shared experiences, and real-time operation. It can transform consumer behavior in consumer identity, social interactions, and ownership. There are future research directions that can be explored.	The metaverse employs digital technology for customer experience, accessible via diverse devices. It transcends limitations set by creators and fosters immersive customer experience, further enhanced by spatial computing and realistic avatars.
Oh et al. (2023)	Investigates whether enhanced social presence in the metaverse promotes supportive interactions among young users (millennials and Generation Z) and reduces feelings of loneliness through improved social self-efficacy.	The metaverse platform owners should place significant importance on social presence, which is crucial for creating customer experience in the metaverse. The metaverse's design and service features should consider sociability features to facilitate supportive interactions among the young population.	By enhancing social presence, the avatar-mediated interventions in a 3D metaverse platform have advantages in facilitating positive interactions and improving social self-efficacy, contributing to a positive affective and relational customer experience.
Hollensen et al. (2023)	Explores the conceptualization of metaverse and its building blocks.	Brands have significant potential to leverage the metaverse to engage with customers in various ways. Identifies eight metaverse building blocks crucial for brands to craft customer experience and analyzes Nikeland through the lens of these building blocks.	The CXMV significantly differs from traditional online experiences, with this distinction relying heavily on cutting-edge hardware and software. Brands venturing into the metaverse should prioritize crafting customer experience that enhances the functionality of their products or services through collaborative cocreation with customers.
Juran and Joonheui (2023)	Investigates the relationship between self-congruence, luxury brand attachment, attitude towards luxury brands, and purchase intentions among users in the metaverse.	Personal self-congruence with the brand fosters attachment and positive attitudes, subsequently influencing purchase intention in the metaverse.	Emotional connection and overall brand evaluation contribute to the customer experience in the metaverse. Customization and trying out virtual items create memorable experiences that influence purchase decisions.
Jafar et al. (2023)	Examines the impact of metaverse attributes on organismic customer experience, product knowledge, and purchase intentions within the metaverse stores.	Explains that the technical features of the metaverse, such as effectiveness, vividness, and interactivity, influence organismic customer experience, which results in favorable purchase intentions for immersive metaverse stores.	The technological features of the metaverse are crucial for generating a highly immersive and realistic customer experience that enhances customers' purchase intentions.
Jafar and Ahmad (2023)	Examines how CXMV influences cognitive processing, satisfaction, and loyalty in metaverse tourism.	Positive customer experience is influenced by immersion, escapism, and enjoyment. This leads to cognitive processing, which increases satisfaction, loyalty, and engagement.	Affective and cognitive customer experience in the metaverse significantly engages customers, potentially boosting platform usage. The metaverse platform managers should focus on developing

(Continues)

TABLE A1 (Continued)

Study	Objective	Key findings	Relevance to the current study
			experiences that can create affirmative customer experience to anticipate positive behavioral outcomes.
Koohang et al. (2023)	Explores the impacts of metaverse adoption across various domains, presenting concise overviews, opportunities, challenges, and proposed research agendas for each.	The metaverse can introduce new business activities, differentiation, and innovative customer experience. Its adoption is analyzed from multiple perspectives, examining opportunities and challenges.	The metaverse offers a multisensory customer experience for brands to seamlessly integrate physical and virtual channels, creating synergies. Simulated product experiences, especially trialability, can influence purchase decisions.
Keegan et al. (2023)	Introduces the metaverse channel and honeycomb model to explain different functionalities.	The metaverse functionalities and affordances are composed of seven elements: presence, sharing, relationships, identity, conversations, groups, and reputation. These are essential for creating a great customer experience for metaverse platform managers.	The CXMV enriches customer engagement through innovative approaches. The social presence offers value cocreation activities, such as adopting a virtual dog, that have real-life impact. Advanced technology customer experience drives platform adoption.
Mladenović et al. (2023)	Advances the concept of sensory word-of-mouth (WOM) in the metaverse, termed metaWOM, building upon key dimensions such as immersiveness, fidelity, and sociability, and seeks to enhance the existing Review chain model.	The metaverse allows businesses to engage customers through immersive experiences. metaWOM generates excitement and influences high-involvement purchase decisions. The realism in the metaverse allows exploring and comparing before deciding.	Social presence is a crucial factor contributing to creating a unique customer experience in the metaverse, fostering a sense of community and co-creating values. Additionally, enhanced social presence through immersive and high-fidelity experiences allows for trials, resulting in a tailored and unique customer experience before purchasing.
Mogaji, Dwivedi, et al. (2023)	Analyzes how fashion brands can use the metaverse for marketing, outlining opportunities and challenges for the key players: fashion brands, tech developers, and consumers.	Explains the role of tech developers, fashion brands and consumers in the metaverse fashion marketing. Provides a conceptual framework for key stakeholders in fashion marketing within the metaverse for future studies.	In the metaverse, cocreation involves tech developers, brands, and consumers collaborating to create an immersive experience. The metaverse facilitates the trialability of branded products, enabling users to experience real-world situations like purchasing and wearing garments virtually. Users can trade and customize branded products, making the metaverse easier to use and increasing its user base.
Jiang et al. (2023)	Constructs a metaverse experience scale and investigates its impact on consumer happiness within the context of luxury brands.	The CXMV includes fantasies, feelings, and fun. It enhances consumer happiness for luxury brands.	The novel metaverse environment for luxury brands generates hedonic happiness, essentially creating affective customer experience.
Ramadan (2023)	Explores the metaverse channel-based marketing strategies using qualitative methods.	The future brand experience across various channels will be altered with the development of the metaverse.	The CXMV combines physical and virtual environments facilitated by cutting-edge technologies, emphasizing the significance of novel customer experience from an omnichannel perspective.

TABLE A1 (Continued)

Study	Objective	Key findings	Relevance to the current study
Rather (2023)	Develops a theoretical framework from an extensive literature review encompassing virtual reality (VR) and metaverse concepts within different domains.	Real-time multisensory integrations in the metaverse influence social presence, engagement, immersion, and exhaustion, ultimately impacting performance, emotions, and evaluations.	The advanced technological features of the metaverse create real-time multisensory interactions that influence social presence. Social presence in the metaverse, facilitated by virtual reality headsets, positively impacts affective and cognitive customer experience.
Richter and Richter (2023)	Proposes a framework by identifying attributes that distinguish the metaverse from prior virtual worlds through a systematic literature review, focusing on the customer experience perspective.	Presents a framework that encompasses four fundamental characteristics of virtual worlds: immersiveness, social networking, persistence, and interoperability. The current metaverse is a result of incremental improvement of the previous virtual world. Provides future research directions.	Technological advancements such as virtual and augmented reality promise a transformative CXMV, enhancing immersion and interaction for comprehensive engagement with virtual environments and intuitive, natural user interactions.
Tan et al. (2023)	Examines the metaverse's impact on marketing ethics, communication, relationship marketing, retail marketing, supply chain management, and transportation management.	Each identified key area contains valuable perspectives, delving into the metaverse's roles, opportunities, challenges, and research agenda.	In the metaverse, customers can try out digital twins for immersive pre-purchase experiences. Brands can use eye-tracking technologies to generate relational customer experience and track customer experience. This can influence the purchase of digital goods and physical products.
Yang (2023)	Investigates creating an immersive metaverse for cultural customer experience, utilizing augmented reality in virtual storytelling to enhance visitor engagement.	Explains augmented reality technology in the metaverse as a significant creator of a greater customer experience in the cultural metaverse.	Augmented reality is one of the critical technologies for creating engaging customer experience in the metaverse.
Park and Kim (2024)	Explores how avatar appearance affects self-congruence, flow experience, and purchase intention in virtual and real products, and studies the impact of virtual world behavior on the real world.	Avatar similarity leads to immersion, enriching customer experience. Metaverse experiences prompt virtual and real purchases.	The self-congruence between avatars and actual appearances influences the metaverse's customer experience. When customers come across avatars that resemble their actual appearances, it creates a sense of social presence and enhances their overall experience in the metaverse. This immersive customer experience encourages customers to purchase digital items for their avatars, influencing them to buy corresponding real-world products.
Yoo et al. (2023)	Provides a summary by reviewing existing literature and proposes a new conceptualization of the metaverse based on four distinct dimensions.	Conceptualizes the current development of the metaverse with the available technology as a transitory metaverse. Identifies the anticipation of amplified customer touchpoints in the metaverse. Specifically, offers 27 research questions about the customer journey in the metaverse.	Customers can engage in novel cocreative experiences facilitated by various technologies, fostering highly sensorial interactions. The metaverse provides an immersive exploration of digital twins for brands, offering detailed product insights and personalized customer experience. Additionally, brands can leverage the metaverse for product testing before physical launches, enhancing the overall customer experience.

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TABLE A1 (Continued)

Study	Objective	Key findings	Relevance to the current study
Current study	<i>This article aims to deepen understanding by empirically investigating how social presence and trialability, conceptualized within the framework of the Service-Dominant Logic (S-D Logic) theory, specifically influence customer experience, users' intention to use the metaverse platform, purchase intention of virtual goods in the metaverse, and spillover effects in the real world.</i>		<i>The findings contribute to the existing literature in the theoretical domain of S-D logic, social presence, and regulatory focus theory within the metaverse context.</i>

Note: To comprehensively explore the literature on customer experience in metaverse, a carefully structured search strategy was employed. Initially, three key search terms were identified: “metaverse” AND (“customer experience” OR “experience” OR “user experience”). All searches were executed on the Google Scholar database, specifically focusing on the timeline from 2013 to 2023. The selection criteria for the literature review emphasized peer-reviewed Q1 journals, limiting inclusion to papers in English from 2013 onward while excluding reports, international conference papers, white papers, local conferences, and early drafts. The Google Scholar search included major online databases (e.g., ScienceDirect, Taylor and Francis Online, etc.). Initially, the search generated a substantial number of articles, consisting of 125. After the screening, a subset of approximately 60 papers was shortlisted for their potential to contribute valuable insights into the customer experience in metaverse. The screening process involved a thorough examination of abstracts, keywords, methodologies, and findings, ensuring that the selected papers met the study's criteria for inclusion in the final review. Subsequently, duplicates and articles lacking substantial contributions to the understanding of customer experience in metaverse were meticulously excluded, resulting in the incorporation of the most relevant 30 papers for the comprehensive literature review. In terms of presenting the review, the study considers a critical analysis of papers reflecting customer experience. For instance, concepts like hedonic experience, pleasure, and enjoyment were collectively interpreted as “affective experience,” while the notion of building connections was categorized as “relational experience.”

TABLE A2 Summary of social presence studies focusing on virtual environments.

Study	Objective	Key findings	Relevance to the current study
Yilmaz et al. (2013)	Assesses the motivation and social presence levels of 42 prospective teachers engaging in an Open Simulator 3-D virtual world, with a focus on exploring factors that impact these levels for effective learning.	Attractive environments positively influence motivation, happiness, learning, self-confidence, and feedback satisfaction. High social presence levels are experienced due to comfort, accessible communication, lack of loneliness, casual conversations, and a heightened sense of presence.	Avatars in a 3D virtual environment enhance social presence, creating a comfortable and expressive atmosphere. Interaction and cooperation reduce loneliness and contribute to a positive emotional experience. Effective communication and cooperative working relationships strengthen connections among users, facilitating better decision-making and enhancing both relational and cognitive aspects of the customer experience.
Lee and Park (2014)	Investigates the effect of e-commerce content on virtual presence, cue multiplicity on telepresence and social presence, and their influence on decision-making.	High cue multiplicity in e-tail increased telepresence and social presence, increasing website trust. However, e-shopping enjoyment remained the same. Social presence significantly impacted website trust, enjoyment, and perceived social approval.	Online retailers use cues like text, context, emotions, and timing to influence customers' purchase decisions. Detailed product information, including images and text, creates a positive customer experience by reducing psychological distances, enhancing trust, increasing shopping enjoyment, and influencing purchase intention.
Felthofer et al. (2014)	Evaluates gender-specific experiences of social and physical presence in a group of older and younger adults while investigating mediation by empathy.	Virtual environment experiences are similar for younger and older adults. Men exhibit more spatial presence than women, and fantasy mediates the gender differences observed.	Fostering social presence in collaborative virtual environments may contribute significantly to creating a positive customer experience for customers, regardless of gender and age.

TABLE A2 (Continued)

Study	Objective	Key findings	Relevance to the current study
Leite et al. (2014)	Examines an empathic model designed for social robots engaging in extended interactions with children.	Results show that the social robot can heighten social presence while interacting with children, exhibiting empathy and engagement.	Empathetic behavior in social robots positively impacts interactions with children. Humanlike mimicry capabilities foster engagement, social presence, and emotional connection. This contributes to a positive affective and cognitive experience, influencing engagement and emotion in interacting with the robot.
Ogara et al. (2014)	Investigates the elements that impact social presence and user satisfaction within the context of Mobile Instant Messaging (mIM).	Frequent mIM users develop rich interaction skills with communication partners, IM applications, mobile phone user interfaces, and features, contributing to heightened social presence and user satisfaction.	In mobile mIM, users' familiarity and interactions significantly influence social presence. Increased interaction heightens immediacy, linked to social presence. System richness, including non-word utterances and visual cues, enhances meaning and personalness, further boosting social presence. This, in turn, provides real-time information about communication partners, improving information exchange and decision-making. User satisfaction and overall customer experience are shaped by leveraging richness and social presence in mIM interactions.
Verhagen et al. (2014)	Validates a model linking friendliness, expertise, and smile to social presence, personalization, and satisfaction in online service encounters.	Friendly and knowledgeable agents enhance social presence and satisfaction in online service encounters. Smiling does not help much. Anthropomorphism does not significantly impact the relationship between agent characteristics and social presence.	In an online environment, the technical expertise of a virtual customer assistant contributes to the creation of social presence. At the same time, the absence of humanlike characteristics and nonverbal cues, such as smiling, may negatively impact social presence. Therefore, a more humanlike figure and characteristics can enhance social presence, creating a more affective customer experience.
Lim et al. (2015)	Assesses whether the backchannel communication of television viewers during a mega-sporting event positively influences their loyalty to sports channels.	Community engagement boosts loyalty. Emotional involvement enhances commitment indirectly. Functional engagement improves perception. Communal and functional engagement positively correlates with social presence, whereas emotional engagement does not.	In the virtual social media environment, functional features enhance social presence, leading to heightened feelings of the presence of others. These interactions and emotional connections contribute to affective and relational customer experience in the virtual environment. The enhanced customer experience, characterized by emotional bonds and a sense of community, influences customers to revisit the virtual channel, indicating increased usage intention.

(Continues)

TABLE A2 (Continued)

Study	Objective	Key findings	Relevance to the current study
Sivunen and Nordbäck (2015)	Investigates the impact of virtual environments on social presence in distributed teams by analyzing meetings through quantitative and qualitative content analysis.	In virtual environment interactions, high behavioral engagement and psychological involvement were frequently observed dimensions of social presence.	Sustained social interactions among participants develop social presence. Technical constraints limit avatars' effectiveness. Appropriate technology is needed to achieve social presence for controlled avatar movements and interactions within the virtual environment.
Tseng et al. (2015)	Examines the impact of network convergence and interdependence, key features of social networks in online gaming, on the continuance intention of gamers.	There is a positive relationship between network convergence, interdependence, sense of community, relational switching cost, and gamer continuance intention.	Social presence refers to feeling part of a virtual community. Regular interactions, trust, and ownership develop this sense of community. It leads to users continuing to use the social network and reducing the likelihood of switching to other alternatives.
Lu et al. (2016)	Explores the relationships among social presence, trust, and social commerce purchase intention.	Identified three variables related to social presence: the presence of the web, perception of others, and social presence of interaction. Social presence is a prerequisite of trust building and purchase intention in online retail.	Social presence in e-commerce includes social presence of the web, presence of others, and social presence of interaction with online sellers. These constructs form a comprehensive understanding of the online marketplace's social atmosphere. The development and enhancement of social presence influence customers' trust, affecting customer experience. Ultimately, social presence significantly influences buyers' purchase decisions.
Jin et al. (2017)	Develops and empirically validates a research model integrating technological and user factors based on social presence and user engagement theories.	Interactivity and sociability are critical antecedents for influencing social presence in the virtual environment. Social factors such as social ties and identity positively influence users' engagement. Both social presence and user engagement positively enhance the intention to purchase virtual goods.	Technology impacts social presence in virtual environments. Virtual features enhance satisfaction and create value through interactions. The connection among users creates value through interactions, which extends beyond the sensory customer experience. Social presence involves creating stable connections and emotional support, resulting in an affective and relational customer experience, influencing the intention to purchase virtual goods.
Makransky et al. (2017)	Develops a standardized multidimensional measure of presence (the MPS) tailored for a virtual reality (VR) learning.	Presented presence as a construct with three elements: physical, social, and self-presence. Developed and validated a 15-item scale (five items for each dimension) to measure presence.	Social presence in virtual environments like virtual reality includes a feeling of coexisting with others, humanlike avatars, natural interactions, and no awareness of the social mediation process. These properties make an immersive customer experience in virtual reality.
Richardson et al. (2017)	Identifies patterns in student outcomes (perceived learning and satisfaction) about social presence by examining differences across the primary studies through meta-analysis.	Social presence is a significant element for generating satisfaction, motivation, and perceived learning in the online environment.	Social presence plays a crucial role in the online environment, influencing satisfaction and perceived learning among participants. Essentially, social presence contributes to creating both affective and cognitive customer experience online.

TABLE A2 (Continued)

Study	Objective	Key findings	Relevance to the current study
Van Doorn et al. (2017)	Introduces automated social presence (ASP) and technology's critical role in social customer engagement, focusing on ASP's ability to make customers feel other social entities.	Explores future frontline experiences enriched with technology by discussing current and emerging examples. Introduces a conceptual framework and testable propositions focused on the ASP.	In an environment where social interactions are automated (ASP), the behavior of individuals is influenced by cognitive and emotional mechanisms. When the ASP is highly humanlike, it can create a relational experience with customers, resulting in warm and friendly communication. In computer-mediated communication, the social presence has a significant impact on outcomes such as customer experience and behavioral intentions.
Algharabat et al. (2018)	Analyzes how telepresence, social presence, and involvement impact consumer engagement, electronic word of mouth, and donation willingness towards nonprofits.	All three elements, including telepresence, social presence, and involvement, act as antecedents to generate engagement for non-profit organizations, subsequently promoting positive electronic word of mouth and willingness to donate.	Social media pages create social presence through personal content like pictures, showing warmth and sociability. This positively impacts brand engagement. Virtual communities and message boards enhance the customer experience.
Kothgassner et al. (2018)	Examines gender differences in elderly individuals' interaction with a computer-controlled agent or a human-controlled avatar.	The emotional impact of virtual experiences is consistent for younger population and the elderly in the virtual reality environment. Gender did not significantly affect social presence, physical presence, or immersion.	Regardless of age, users who interact through avatars in a virtual reality environment experience higher social presence. This implies a more pleasurable and intense customer experience in terms of both affective and cognitive aspects. The social presence in the virtual environment, facilitated by avatars, contributes to a more realistic impression and enhances the overall customer experience for users.
Tussyadiah et al. (2018)	Discovers various favorable outcomes resulting from the feeling of presence in virtual reality (VR) encounters.	Enjoyment of virtual reality customer experience is heightened by the presence of social interaction in the virtual environment. Social presence is an antecedent to generate positive choice, and the customer experience generated through the process evokes positive intention.	Social presence experienced in virtual reality can create a feeling that virtual entities, such as other customers, are actual social actors, leading to a psychological impact on the user. This impact is not limited to sensory inputs but involves non-sensory aspects of the overall customer experience, positively affecting the user's intention to purchase.
Jiang et al. (2019)	Explores how information support influences the relationship between various dimensions of social presence and trust within social commerce.	Three dimensions of social presence were significant in creating trust in the merchant. The trust generated by social presence and moderated by information support positively impacts purchase intention.	Social presence in online interactions fosters trust in e-commerce by reducing uncertainty through shared experiences, reviews, and recommendations. Salespeople and commodity characteristics like visuals and texts amplify this trust, positively impacting the customer experience and intention to purchase.

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TABLE A2 (Continued)

Study	Objective	Key findings	Relevance to the current study
Gallup et al. (2019)	Investigates the influence of social presence on contagious yawning in virtual reality (VR) through five conducted experiments.	Social presence plays a critical role in virtual reality and affects participant behavior. However, social cues in the physical world have a more significant impact than those in the virtual environment.	Social cues and effects, such as contagious yawning, may not have the same impact in virtual reality as in the real world due to limitations in the ability of avatars to convey them effectively. This indicates a difference in the dynamics of social presence in virtual reality compared to actual reality, with the latter having a more significant impact on participants' responses.
Kothgassner et al. (2019)	Examines whether various forms of social support (virtual vs. actual) provided before the Trier Social Stress Test (TSST) would reduce stress.	No disparity in terms of the stress tests was observed in the agency concerning social presence.	Social presence in the virtual environment, specifically through avatar interactions, has the potential to replicate emotions and cognitive responses similar to the real world. The study suggests that social presence in a virtual environment, facilitated by avatars, can indeed lead to positive affective and cognitive customer experience.
Miller et al. (2019)	Experiments three studies designed to assess the social psychological impacts of augmented reality (AR).	Task performance, nonverbal behavior, and social connectedness are notably impacted by the inclusion or exclusion of virtual content through augmented reality. Social presence through augmented reality is significantly different from face-to-face interaction.	Augmented Reality headsets may reduce social presence compared to in-person interactions, leading to lower interpersonal attraction. The study suggests that the augmented reality environment may not effectively convey social dynamics and connections during social interactions.
Toader et al. (2019)	Explores how AI chatbots positively impact customer support in the digital channels.	Compared to male AI chatbots, positive consumer responses are significantly influenced by highly anthropomorphized female chatbots exhibiting social behaviors, even in situations involving errors.	Visual elements in AI chatbots create a personalized experience that enhances customer experience. For instance, gendered avatars evoke significantly different emotional outcomes in the interactions. Therefore, incorporating anthropomorphic and visual aspects is essential in developing conversational agents.
Ye et al. (2019)	Examines a trust-enhancing strategy through utilitarian and hedonic engagement to address the impersonal nature of web mediation and its impact on trust and purchase intention.	Validates the effectiveness of social presence in enhancing peer-to-peer customer trust and purchase intention via cognitive and affective engagement.	Social presence is crucial in the virtual environment to humanize the interaction, create personal cues, and foster a social connection with sellers. This enhances the shopping experience, improves perceived usefulness and ease of use, and creates a positive customer experience. Ultimately, this set of outcomes builds trust in the platform and promotes purchase intention.
Andel et al. (2020)	Investigates how to enhance social presence in online learning and explores its benefits through an experimental design.	Adding a comment section in online video learning fosters social presence among users, enhancing perceived learning and satisfaction in online contexts.	In online environments, particularly online video features such as real-time comments contribute to higher social presence perceptions among users. This heightened social presence, in turn, is

TABLE A2 (Continued)

Study	Objective	Key findings	Relevance to the current study
			associated with positive outcomes such as satisfaction. Therefore, including interactive elements like the comments section facilitates a more engaging and satisfying online customer experience.
Syrjämäki et al. (2020)	Examines if eye contact in virtual reality (VR) produces attention and feeling-oriented psychophysiological responses similar to face-to-face interactions.	Virtual reality reduces attention and feelings-related responses to gazing compared to real-time interactions with people.	Virtual reality's limited visual fidelity and unrealistic avatars negatively affect nonverbal communication, particularly regarding direct and averted gaze. This results in fewer practical simulations of social presence and realistic experiences than in real-time environments.
Wedel et al. (2020)	Examines advancements in the applications of virtual reality (VR) and augmented reality (AR) as well as research related to consumer marketing.	Offers a research framework for virtual and augmented reality in consumer marketing, focusing on customer experience and application effectiveness throughout the customer journey. It provides an overview of existing research and applications and suggests future research directions for the virtual and augmented reality domains.	Haptic features in virtual reality play a crucial role in fostering sensory presence. They improve task performance and create a more immersive experience, leading to heightened emotions and customer experience. Haptic controls significantly impact consumers' willingness to pay and purchase intention more than voice controls.
Ye et al. (2020)	Constructs a model examining how social presence and telepresence impact emotional responses—trust, enjoyment, and sociability.	Customers' purchase intention is indirectly influenced by three social presence dimensions (social presence of the Web, other buyers, and sellers) and telepresence in the peer-to-peer accommodation online commerce.	In online peer-to-peer accommodation, various dimensions of social presence play crucial roles. social presence on the website, characterized by elements like human contact and warmth, and social presence involving other buyers collectively contribute to building trust. This trust, rooted in affective and cognitive customer experience, significantly impacts purchase intention. Furthermore, the website, buyers, and sellers collectively shape the customer experience and value cocreation.
Adam et al. (2021)	Studies user request compliance in a randomized online experiment, exploring the impact of verbal anthropomorphic design cues and the foot-in-the-door technique.	Anthropomorphic design cues and the need for consistency significantly increase user compliance with AI chatbot service feedback requests, with social presence mediating the impact of anthropomorphism on compliance.	Verbal anthropomorphic design cues, such as a personalized name, first-person pronouns, small talk, and empathy signals, boost users' compliance with a chatbot's service feedback request and contribute to heightened social presence. Increased social presence makes the chatbot seem humanlike and leads to a better customer experience.

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TABLE A2 (Continued)

Study	Objective	Key findings	Relevance to the current study
Cohen et al. (2021)	Evaluates the virtual reality's impact on empathy and social presence's influence on empathic responses.	Participants in the virtual reality environment indicated elevated levels of social presence, and viewers' empathic care and facial synchrony with the target were enhanced.	Virtual reality offers customers a unique, immersive experience using a head-mounted device or a traditional computer screen. A 360-degree 3D video can create a genuine sense of presence and foster connections with the virtual environment. Thus, virtual reality evokes social presence, consequently generating affective and relational customer experience.
Qin (2021)	Examines the relationship between the attractiveness of game elements, player satisfaction, sense of presence, enjoyment, and gameplay duration in Pokemon Go.	Autonomy- and relatedness-supportive elements, associated with player needs, significantly contribute to presence. The satisfaction of autonomy and competence influences the duration of gameplay.	In gamified environments facilitated by AR, where autonomy and relatedness are supported, users experience a heightened sense of presence, such as social presence, leading to satisfaction and enjoyment. This, in turn, positively influences the length of usage or gameplay, indicating a positive impact on usage intention.
Sinatra et al. (2021)	Seeks to define and explore realistic social behavior, distinguishing subcategories and examining avenues for enhancing learning outcomes.	Realistic social presence is crucial for learning in non-social domains. Tradeoffs arise in implementing specific forms of realistic social presence, and it is essential to consider individual differences.	In a virtual environment, agents with a physical form can enhance social presence by exhibiting gestures, such as nodding their heads, matching personalities among participants, and ensuring high acoustic quality in voice, pitch, rate, and language. These elements contribute to making the customer experience more immersive and compelling.
Barreda-Ángeles and Hartmann (2022)	Explores the links among presence, user activities, and psychological gains—such as relatedness, self-expansion, and enjoyment—during the COVID-19 pandemic.	Feelings of spatial presence predict three outcomes, while social presence specifically predicts relatedness and enjoyment but not self-expansion. Social distancing measures correlate with increased virtual reality platform usage and signaling psychological needs during frustrating times.	In virtual reality, advanced technology like head-mounted devices and haptic gloves creates lifelike experiences, fostering social presence for enriched affective and sensory customer experience. Avatars resembling real-life selves enhance relatedness, contributing to a positive overall experience. Three-dimensional displays and improved tracking technology enhance social presence and enjoyment in social virtual reality platforms.
Hasenbein et al. (2022)	Examines how various social-related factors in the classroom impact students' visual attention in immersive virtual reality (IVR).	In the interactive virtual reality classroom, participants at the front were attentive to instruction, while those at the back were more socially engaged. Cartoonish avatars may not distract from learning and may even spark curiosity. Raising hands and gazing in virtual reality draws more attention.	Users in a virtual reality environment tend to be more engaged, as indicated by their gaze behaviors. They tend to focus more on their peers and the screen and make more eye contact with other participants. These gaze patterns reflect the nonverbal cues of social presence and contribute to a more immersive user experience. Raising hands can also draw more attention, indicating increased social presence in the virtual reality environment.

TABLE A2 (Continued)

Study	Objective	Key findings	Relevance to the current study
Sereno et al. (2022)	Explores multi-user Augmented Reality in the context of Computer-Supported Collaborative Work, presenting the current state of research.	Categorize into space, time, role and technology symmetry, and output/ input modalities. Offers design insights for collaborative augmented reality and highlights hardware considerations and 3D data exploration.	Collaborative augmented reality enables customers to share emotions and perceptions remotely, enhancing customer experience. Enriched shared perspective through collaborative AR facilitates the cocreation of value and a more immersive customer experience.
Yuan et al. (2023)	Examines factors influencing parasocial relationships (PSR) in virtual reality (VR) shopping, their influence on brand equity, and the moderating function of the vigorous attributes of a celebrity endorsement.	Finds that the physical attractiveness of the celebrity, social presence in virtual reality, and the novelty of technology foster parasocial relationships between the celebrity and followers, thus contributing to brand equity.	In a virtual reality shopping environment, humanlike features create a sense of warmth and sociability, leading to an increased social presence. This fosters parasocial relationships between consumers and media personalities or within the virtual reality experience, leading to economic benefits for brands and affecting brand equity.
Jayawardena et al. (2023)	Proposes a conceptual model that applies the Elaboration Likelihood Model (ELM) to persuade consumer attitudes through virtual and augmented reality ads based on a literature review.	Six research propositions were proposed. Variables like source credibility, social presence, and message substance can be utilized for persuasion in augmented and virtual reality advertisements.	Physical attractiveness and technological novelty in augmented and virtual reality advertisements contribute to social presence. The heightened social presence enhances customer experience in virtual and augmented reality, potentially leading to positive changes in consumer attitudes.
Kozinets (2023)	Introduces a new qualitative approach for service researchers to investigate immersive technologies, considering their holistic and human characteristics amid increasing adoption.	Creates a netnography to explore the service research opportunities introduced by immersive technologies. Suggests that future service researchers can benefit from adopting qualitative research methods to study immersive technology experiences.	People are already encountering automated social presence through various applications such as interacting with robots, virtual assistants, and simulated or early versions of metaverse such as Second Life. These technologies provide social presence and affect customer experience. Therefore, immersive technologies, including recent versions of the metaverse, can heighten social presence and enhance customer experience.
Ningning and Wenguang (2023)	Seeks to guide young people from harmful behaviors, encouraging active sports, healthy exercise, and holistic development.	Virtual sports experiences impact young people's participation in sports and fitness. Sports video games improve competitive skills in a simulated environment.	In e-games, users achieve social presence through collaboration, value cocreation, and interactivity. Sharing ideas and applying learned concepts enhances the affective, cognitive, and relational customer experience. Enhanced customer experience generated by social presence may lead to a spillover effect, influencing positive behaviors in the real world, such as increased willingness to participate in the activities performed in the virtual world.
Torro and Pirkkalainen (2023)	Enhances understanding of interpersonal communication in social virtual reality (SVR) by exploring how SVR enables social	Proposes a theory for designing information systems that facilitate social exchange in virtual teams that use social virtual reality	Social presence in social virtual reality results from co-presence, the technology's ability to convey communicative signals (verbal and

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TABLE A2 (Continued)

Study	Objective	Key findings	Relevance to the current study
	exchange, explicitly focusing on trust and reciprocity patterns, and assessing its impact on virtual team performance.	technology. It explains how the properties of social virtual reality enable social exchange and introduces principles for designing it. It also introduces the concept of interacting with presence, which enhances users' perceptions of affordances in social virtual reality.	nonverbal), and the plausibility of communication processes. The technology's capacity to transmit realistic cues and plausible communication creates a compelling and immersive experience in social virtual reality, fostering social presence. This social presence enables value cocreation through social interactions, facilitating affective, sensory, cognitive, and relational customer experience in social virtual reality.
Current study	<p><i>Social presence has been studied in various tech environments like mobile communication, social media, online commerce, AI-driven chatbots, and immersive tech (AR/VR). However, the metaverse lacks empirical research on the impact of social presence on customer experience, potentially affecting the spillover effect of purchase intention and platform usage intention. The current study mitigates this gap.</i></p>		

Note: In conducting an extensive literature review on social presence, three distinct sets of search terms were employed: “social presence virtual,” “Social presence augmented reality,” and “Social presence virtual reality.” The search on the Google Scholar database from 2013 to 2023 focused on peer-reviewed Q1 journals published in English. Exclusion criteria included reports, international conference papers, white papers, local conferences, and early drafts. The combined initial search for the sets of keywords produced a comprehensive pool of 360 articles. The subsequent selection and inclusion process narrowed down the relevant articles for the literature review on social presence. The initial search for “social presence virtual” as a keyword yielded 110 articles, from which 52 were considered, and 18 were ultimately included in the review. Subsequently, combining “Social presence” and “augmented reality” generated 120 articles, with an initial filter resulting in 45 articles considered and nine included. Lastly, using “Social presence” and “virtual reality” as keywords produced 130 articles, from which 49 were carefully reviewed, leading to the final inclusion of 14 articles. These three sets of keywords yielded 39 articles for the comprehensive literature review on social presence.

TABLE A3 Summary of trialability studies in virtual environments.

Study	Objective	Key findings	Relevance to the current study
Alshamaila et al. (2013)	Leverages the technological, organizational, and environmental framework, employed semi-structured interviews to investigate cloud computing adoption in 15 small to medium-sized enterprises (SMEs) and service providers in northeast England.	The main factors identified as playing a significant role in small to medium-sized enterprises adoption of cloud services were relative advantage, uncertainty, geo-restriction, compatibility, trialability, size, top management support, prior experience, innovativeness, industry, market scope, supplier efforts, and external computing support.	Trialability plays a crucial role in shaping customers' affective responses, fostering confidence and trust, and influencing cognitive aspects, such as rationale, positively impacting purchase intention. This, in turn, contributes to an enhanced customer experience.
Hsing et al. (2013)	Empirically identifies and assesses determinants influencing E-Blog adoption in the service industry, emphasizing organization size as a moderating factor.	E-Blog enhances enterprise reputation through social exchange. E-Blog underscores trialability's importance in addressing concerns and enabling experimentation before full adoption. Virtual trust and an unfamiliar social structure hinder E-Blog adoption.	In technology-mediated environments, such as adopting E-Blogs, trialability enhances the development of customer relationships, fostering stronger connections and improving the overall customer experience. This strategic approach allows customers to experiment, experience, and evaluate products before committing to them.
Blázquez (2014)	Aims to explore the impact of online experience in multichannel fashion shopping.	Technology integrates channels and renews physical stores to enhance customer experience. Online channels should encourage the adoption of new interactive tech.	Virtual fitting rooms, a trialability feature in online stores, enhance sales and reduce returns. Users generate personalized models by inputting their image, height, and weight to try out items, enabling consumers to specify preferences. Retailers employ automation to offer tailored recommendations based on these models.
Raman et al. (2014)	Explores the adoption of Virtual Labs (VLAB), a multi-institutional Open Educational Resources (OER) initiative through virtual experiments.	Compatibility, ease of Use, relative Advantage, and trialability were dominant factors influencing adoption of the Open Educational Resources (OER) system.	Trialability notably influences the intention to use a virtual system. The opportunity for users to experiment or experience the virtual system before making a full commitment plays a crucial role in shaping their willingness and determination to use the system.
T. L. Huang & Liu (2014)	Examines how presence, media richness, and narrative experiences contribute to experiential value in augmented reality interactive technology (ARIT).	Narrative experience yields a superior experiential value compared to alternative simulative experiences, encompassing presence and media richness.	Trialability via ARIT generates a unique customer experience that is easily retrievable, fostering positive consumer behavior. Furthermore, trialability enables customers to achieve a positive return on investment, including better financial, time, behavioral, and mental returns.
Yaoyuneyong et al. (2014)	Investigates the impact of virtual dressing rooms on consumer attitudes and purchase intentions, utilizing uses and gratifications theory.	Virtual dressing rooms enable consumers to have virtual apparel try-ons. They increase satisfaction, purchase intention, and customer-brand relationships while reducing perceived risks.	Trialability, through virtual dressing rooms, offers personalized or non-personalized customer experience with standard or customized avatars with product information. Shoppers can try on multiple outfits, get feedback from friends via integrated webcam virtual dressing rooms, and cocreate value before purchasing.

(Continues)

TABLE A3 (Continued)

Study	Objective	Key findings	Relevance to the current study
Huang and Liao (2015)	Predicts factors influencing consumers' sustainable relationship behavior using ARIT.	Highly innovative online consumers prioritize usefulness, aesthetics, and service excellence in augmented reality. Meanwhile, those with low innovativeness prioritize ease of use and playfulness.	Fashion brands offer trialability through augmented reality to provide a dynamic, time-saving, and value-rich shopping experience. Customers can virtually try on clothes, reducing risk and expediting purchase decisions. Augmented reality enhances entertainment, creates a positive brand impression, and offers affective and cognitive customer experience, choice excellence, and convenience.
Chang et al. (2016)	Examines the influence of virtual community building, website performance expectancy, effort expectancy, trialability, and two mediators (familiarity and perceived risk) on online shopping intention.	The study reveals that performance and effort expectancy positively impact website familiarity and virtual community building. Trialability positively influences product familiarity, while perceived risk negatively influences purchase intention.	Trialability, mainly through technologies like virtual reality, serves as a bridge, enabling virtual product interaction and providing a quality signal prepurchase. This leads to sensory-rich, affective, and cognitive customer experience, building familiarity and confidence. Positive trial experiences in the virtual environment positively impact purchase intention.
Javornik (2016a)	Evaluates media characteristics of interactive technologies for relevance to augmented reality apps and discusses potential effects on consumer behavior based on literature review.	Augmented reality has unique characteristics regarding interactivity, connectivity, and location specificity. Further research is needed to explore its potential in marketing theory and retail settings.	Augmented reality try-on or trialability features enhance shopping experiences by providing personalized and immersive product visualization, positively influencing consumer intentions and willingness to pay. Furthermore, trialability positively impacts consumer intentions and willingness to pay, especially for experienced products. They also improve brand knowledge by overcoming website limitations.
Javornik (2016b)	Explores two augmented reality applications and analyzes consumer responses to their media characteristics through experiments.	The trialability feature provided customers with greater flexibility. In the experiment, augmented reality was perceived as a less interactive technology.	Augmented reality's virtual try-on feature improves customer experience and fosters flexibility, leading to increased intention to reuse the application.
Hilken et al. (2017)	Shows how augmented reality-based service augmentation enhances customer value perceptions through simultaneous simulated physical control and environmental embedding.	Augmented reality-enhanced interaction affects online service experiences both emotionally and cognitively. Spatial presence enhances decision comfort.	Augmented reality-enabled trialability promotes value cocreation, shaping personalized experiences and aiding real-time decision-making. It provides an inexpensive option for testing products, emphasizing fit and feel, which benefits brands. Trialability, such as Virtual mirrors, contribute to affective and cognitive customer experience.
Pantano et al. (2017)	Explores the impact of trialability of the product through augmented reality technologies on consumer behavior in online retail environments, comparing two distinct cultures.	In Italy and Germany, trialability, through augmented reality, helps with buying decisions on e-commerce sites by providing product info and simulating appearance, increasing the likelihood of online purchases.	Regardless of cultural differences, the trialability feature through virtual try-on empowers customers to make purchases, indicating the positive impact on both affective and cognitive customer experience. This implies that the virtual try-on feature enhances the overall

TABLE A3 (Continued)

Study	Objective	Key findings	Relevance to the current study
			customer experience, making online purchasing more appealing for brands.
Poushneh and Vasquez-Parraga (2017)	Investigates the impact of augmented reality on retail customer experience and its subsequent influence on user satisfaction and willingness to buy.	Augmented reality enhances the perception of reality by overlaying information onto the real world and also generates playfulness, creating an enjoyable shopping experience.	Augmented reality's trialability feature, allowing customers to experiment with colors and styles, enhances personalized customer experience. Moreover, it enables unlimited product interaction, resulting in enjoyable affective and cognitive customer experience and promoting the purchase of tried products.
Rese et al. (2017)	Explores augmented reality's overall perception and acceptance in four experiments—two with marker-based and two with markerless AR apps—to measure users' experiences.	Reveals that the relative importance of hedonic (enjoyment, pleasure, fun) and utilitarian (information) aspects varies among different types of augmented reality apps, emphasizing the necessity of considering these variations for effective enhancements.	The trialability feature in augmented reality facilitates informed purchase decisions in the prepurchase stage, instilling confidence and cultivating a positive customer experience in retail. Brands vary in the level of augmentation provided by their augmented reality apps, contributing to personalized customer experience and influencing purchase intentions.
Yim et al. (2017)	Explores the effectiveness of augmented reality as an e-commerce tool for sunglasses and watches through two experiments.	Augmented reality is better than web-based presentations, providing more novelty, immersion, enjoyment, and usefulness, positively impacting attitudes, and increasing purchase intention. Immersion in augmented reality leads to two outcomes: usefulness and enjoyment.	Augmented reality is better than virtual reality for virtual product trials, saving time in shopping and transportation, and upgrading e-commerce. Augmented reality-based presentations outperform traditional web displays in media novelty, immersion, enjoyment, usefulness, attitude, and purchase intention. However, holding the product to the camera may diminish augmented reality's impact, leading to a negative customer experience.
Beck and Crié (2018)	Aims to investigate the impact of an online virtual fitting room (VFR) on consumers' exploratory behavior and intentions to purchase in both online and offline contexts.	Two experiments demonstrated a significant increase in specific curiosity about the product, intention to patronize (both online and offline), and intention to purchase (both online and offline) in the presence of the trialability tool.	Trialing the product through a virtual fitting room positively influences both affective and cognitive customer experience, evoking curiosity and fostering patronization of the product. The virtual try on the product motivates customers to gather more information and implies a positive behavioral outcome. This ultimately results in a spillover effect, positively influencing customers' purchase intention online and offline.
Erra et al. (2018)	Implements Unity 4 Pro with Microsoft Kinect 2, validated by a user study.	A virtual dressing room enabled by technology is a valuable tool for trying out products. Interaction with the 3D model creates a natural customer experience.	Consumers find trying out products in a virtual environment efficient and valuable, enabling them to assess the suitability and fit of a dress by moving around. In other words, trialability in a virtual environment evokes real-life-like customer experience.

(Continues)

TABLE A3 (Continued)

Study	Objective	Key findings	Relevance to the current study
Miell et al. (2018)	Evaluates 20 fit and size technologies from a sample of 30 using content analysis to assess website design and operation, linking academic theory and practice.	Utilizing trialability features for consumer tracking aids retailers in shaping future merchandising plans. Varied technologies across channels can lead to a negative customer experience. The absence of realistic 3D avatar creation is a crucial factor to be addressed to ensure a positive customer experience.	By combining technologies, including fit and sizing technology through augmented and virtual reality, trialability is empowered, ultimately facilitating a seamless purchase journey. However, there is room for improvement in developing and employing technologies to enhance the customer experience, as more than the existing technologies may be required to create a memorable and affirmative customer experience through the trialability feature.
Scholz and Duffy (2018)	Examines consumer-brand relationships focusing on an ethnographic study using the brand's mobile augmented reality shopping app at home.	Branded augmented reality apps in customers' personal space foster self-identity and build intimate relationships with brands. The home environment supports personalized interactions that encourage self-expression and experimentation.	The trialability aspect of augmented reality, enabling consumers to augment their bodies and faces, extends flexibility and influences their self-perception within their personal space. This feature establishes a space within the apps for fantasy and playful interaction, creating a personalized and interactive mirror effect with great freedom and confidence.
Tussyadiah et al. (2018)	Uncovers several positive consequences of the sense of presence in virtual reality (VR) experiences.	Feeling present in virtual reality experiences of a tourism destination increases enjoyment, preference, liking, and interest, leading to a higher intention to visit. This positive emotional experience influences attitudes and increases the likelihood of visiting.	Virtual reality is a potent marketing tool, offering features like trialability and compelling imagery for a "try before you buy" experience. This allows individuals to sense what it is like to be in a real-world scenario, fostering purchase intention.
Zhang et al. (2019)	Explore how virtual try-on technology influences online consumers' purchase decisions, particularly integrating utilitarian, hedonic, and risk perspectives toward purchase intention.	Virtual try-on technology affects online garment purchase intention. Attitudes are influenced by perceived usefulness, enjoyment, and privacy risk. Ease of use affects usefulness and helpfulness. The impact is similar across age groups and genders.	Virtual try-On technology enhances online retailing, allowing customers to visualize outfits on-screen and make informed purchase decisions. This fosters a positive emotional and cognitive customer experience and ultimately influences positive purchase intentions. Virtual try-on technology allows customers to share their tried looks with friends, further strengthening the decision-making process. However, age affects virtual try-on technology adoption.
Lee and Xu (2020)	Classifies available Virtual Fitting Room (VFR) technologies based on customer experience, distinguishing between cognitive and affective customer experience, using data from different sources.	Customers seek both utilitarian and hedonic customer experience through virtual fitting rooms. Virtual fitting rooms are classified into seven categories, each offering distinctive experiences that vary for consumers. There is potential for future improvement in trialability through a virtual fitting room.	Virtual fitting rooms provide accurate sizing information and offer virtual product trials based on body measurements. They reduce returns, increase sales, and engage consumers through various channels and technologies. Virtual fitting rooms create immersive and entertaining customer experience, but their perceived accuracy, attractiveness, and interactivity can vary, impacting the functional and experiential aspects of the

TABLE A3 (Continued)

Study	Objective	Key findings	Relevance to the current study
			customer journey. Poor representation of body and facial images can negatively impact the affective and cognitive customer experience.
Kang et al. (2020)	Explores the impact of 3D virtual reality (VR) on online purchases, focusing on interactivity, spatial cues, and graphics quality.	Interactivity and visuals enhance perception. Both features impact purchase decisions. Graphics matter more in 2D than 3D virtual reality.	Through Stereoscopic displays in virtual reality headsets, trialability helps customers assess the size and fit of products. Direct interaction reduces the perceived risk of online shopping. Trialability contributes to playfulness, fostering affective customer experience, and enhancing confidence in virtual reality retail. The combination of playfulness and informativeness in trialability significantly influences purchase decision-making.
Kim et al. (2021)	Explores how interactivity and vividness in a virtual furniture store affect consumer behavior.	Virtual reality enhances the shopping experience by presenting realistic product images in a 3D environment, contributing to richer product information and significantly generating enjoyable customer experience.	Brands leverage trialability to empower consumers to comprehensively evaluate product size, texture, and dimensions in 3D, facilitating a realistic prepurchase visualization. Trialability, enhanced by virtual reality, elevates sensory experience by simulating the real world through sight, touch, hearing, smell, or taste, generating memorable and enjoyable customer experience.
Xi and Hamari (2021)	Conducts a systematic review of 72 research papers (83 studies) investigating virtual reality retail.	Provides a concise summary of methodologies, theories, devices, technologies, products, and environments and inspires interdisciplinary virtual reality research. Multisensory technologies and the presence of shoppers and sales assistants can influence customer experience.	Product trials through virtual reality create an enjoyable and safe customer experience across various brand categories. Virtual reality's ability to recreate real-life scenarios allows customers to try extreme products, like simulating driving, providing a safe and immersive trial experience that evokes affective, sensory, and cognitive customer experience.
Akour et al. (2022)	Empirical study explores Gulf region students' views on educational metaverse systems, incorporating key factors such as trialability, compatibility, user satisfaction, and personal innovativeness.	Indicates that adopting metaverse systems is significantly influenced by properties such as trialability, observability, compatibility, and complexity. Highlights that personal-based characteristics, particularly personal innovativeness, play a substantial role in adopting metaverse systems.	The higher perceived trialability feature in a metaverse system contributes to both emotional (affective) and mental (cognitive) aspects of the customer experience. This leads to heightened satisfaction and fosters positive attitudes toward adopting the metaverse system. Users value the ease of trying and interacting with the system before making a total commitment, reflecting a positive impact on their overall customer experience and intention to use it.
Almarzouqi et al. (2022)	Empirically assesses students' perception of metaverse	User satisfaction is crucial for metaverse adoption. Perceived trialability, observability, and	Trialability mitigates risk and improves both affective and cognitive customer experience,

(Continues)

TABLE A3 (Continued)

Study	Objective	Key findings	Relevance to the current study
	application for medical education in the UAE.	compatibility with organizational context are positive factors for adopting the metaverse.	ultimately fostering the intention to use the metaverse.
Wang (2022)	Explores how m-payment innovation attributes influence customers' utilitarian and hedonic value perceptions and their intention to continue using m-payment.	The compatibility and relative advantage of m-payment positively influenced utilitarian and hedonic values. Finds that the trialability of m-payment is closely linked to the creation of cognitive customer experience related to utilitarian aspects rather than affective customer experience.	Incorporating the option to try a technological product positively impacts customers' utilitarian value, signifying cognitive customer experience, ultimately influencing the intention to use the technology or platform positively.
Rohil and Parikh (2024)	Introduces a virtual try-on network employing a generative adversarial network.	Addresses shortcomings in existing virtual try-on models and emphasizes self-supervised virtual try-on utilizing real person images.	Image-based trialability in the virtual setting is one of the significant ideas for brands. However, some shortcomings, such as the position texture and angle because of the orientation, may hinder customer experience using image-based trialability.
Current study	<i>Trialability involves trying out branded products and has been extensively investigated in various virtual environments and online channels. However, the trialability feature for branded customer products within the metaverse has yet to be researched. This study aims to fill this gap by empirically investigating the trialability feature for branded products in the metaverse, exploring its relationship with customer experience, platform usage intention, and potential spillover effects.</i>		

Note: For a comprehensive literature review on trialability, four search terms were employed: “trialability” AND “virtual world,” “virtual try on,” “virtual dressing room,” and “virtual fitting room.” Utilizing the Google Scholar database, the searches spanned from 2013 to 2023, focusing on peer-reviewed Q1 journals in English: exclusions comprised reports, international conference papers, white papers, local conferences, and early drafts. For the “trialability” AND “virtual world” keywords, an initial search yielded 120 articles, with 36 shortlisted and eight ultimately included in the review. This set elucidated trialability as a feature fostering technology adoption in areas like computer-mediated communication (CMC), software, and the metaverse. The “virtual try on” keywords resulted in 110 articles, with 42 under consideration and 13 included in the final review. Similarly, “virtual dressing room” produced 100 articles, leading to 50 considered and seven included. The “virtual fitting room” keywords generated 100 articles, with 24 reviewed and three included. Notably, there were overlaps in results previously covered by the earlier keywords. After meticulous searches and reviews, 29 articles were deemed most relevant and are presented in the comprehensive literature review section.

TABLE A4 Demographic characteristics of respondents (N = 286).

Sociodemographic characteristic	No.	%	
Gender	Female	148	52%
	Male	138	48%
Age (years)	18–24	8	2%
	25–34	59	21%
	35–44	195	68%
	45–54	11	4%
	55–64	10	3%
	≥ 65	3	1%
Household income (US\$)	< \$10,000	1	0%
	\$10,000–\$19,999	2	1%
	\$20,000–\$29,999	7	2%
	\$30,000 to \$39,999	5	2%
	\$40,000 to \$49,999	29	10%
	\$50,000 to \$59,999	140	49%
	\$60,000 to \$69,999	23	8%
	\$70,000 to \$79,999	24	8%
	\$80,000 to \$89,999	21	7%
	\$90,000 to \$99,999	24	8%
	\$100,000 to \$149,999	10	3%
≥ \$150,000	0	0%	
Education level	Less than high school degree	0	0%
	High school graduate	3	1%
	Some college but no degree	0	0%
	Associate degree in college (2 years)	8	3%
	Bachelor's degree in college (4 years)	249	87%
	Master's degree	22	8%
	Doctoral degree	2	1%
Professional degree (e.g., JD, MD)	2	1%	
Experience with metaverse	Less than 1 month	3	1%
	1–3 months	28	10%
	4–6 months	74	26%
	7–12 months	75	26%
	About 2 years	76	27%
	> 2 years	30	10%
Metaverse platform used (selected by the respondent at the start of the survey)	Axie Infinity	4	1%
	Blankos Block Party	1	0%
	Bloktopia	3	1%
	Decentraland	8	3%
	Enjin	6	2%
	Fortnite	9	3%
	Horizon Worlds	13	5%
	Illuvium	3	1%
	NVIDIA	15	5%
	Roblox	91	32%
	Sandbox	68	24%
Somnium	1	0%	

(Continues)

TABLE A4 (Continued)

Sociodemographic characteristic	No.	%
Star Atlas	17	
Unity	13	5%
Upland	5	2%
Voxels	13	5%
ZEPETO	16	6%
Reasons for using metaverse platform		
Social connection	64	22%
Interaction with virtual objects	108	38%
Work collaboration	62	22%
Experiencing the unattainable	52	18%