



Unlocking the impact of brand engagement in the metaverse on Real-World purchase intentions: Analyzing Pre-Adoption behavior in a futuristic technology platform

Ruchi Payal^a, Nitika Sharma^b, Yogesh K. Dwivedi^{c,d,*}

^a Institute of Management Technology, Ghaziabad, India

^b International Management Institute New Delhi, India

^c Digital Futures for Sustainable Business & Society Research Group, School of Management, Swansea University, Bay Campus, Fabian Bay, Swansea SA1 8EN Wales, UK

^d Symbiosis International (Deemed University), Pune, Maharashtra, India

ARTICLE INFO

Keywords:

Metaverse
Brand Active Engagement
Metaverse Interactivity
Purchase intention

ABSTRACT

We propose metaverse as a medium for customer brand active engagement and for stimulating the purchase intentions towards a brand in real world. The participants recruited for the study were Gen Z respondents who are the main adopters of metaverse. 'Nikeland' in Roblox (one of the successful early versions of metaverse) was chosen as the experiential space for the participants. The results indicated that the new age consumers are looking forward to metaverse as futuristic technology platform and reported that interactivity (user active control, two-way communication, synchronicity) in the metaverse world positively impacts the consumers' experience of brand trust, brand knowledge and brand attachment which in turn impact the brand active engagement leading to 'consumer purchase intention of the product experienced in metaverse' in the real world. The marketers and advertisers can engage customers in metaverse through initiatives like Digital bill boards, NFTs, virtual events, virtual tours, virtual avatars and virtual stores.

1. Introduction

Metaverse has gained attention in the technology and the business world in the last few years (Kim, 2021). Metaverse is a collective virtual shared space, created by the convergence of virtually enhanced physical and digital reality. It is persistent providing enhanced immersive experiences (GSMA, 2022; Kang & Ki, 2024), as well as device independent and accessible through any type of device, from tablets to head-mounted displays (Gartner, 2022). This futuristic technology platform utilizes emerging technologies like virtual reality, augmented reality, emerging payment systems (NFT, Crypto), chatbots, digital avatars, digital assistants and most importantly web3.0 (3d Graphics, block chain, artificial intelligence) to enhance the customer experience. The objective of the metaverse is to integrate the offline touch and feel experience with the online convenience and speed (GSMA, 2022).

The global Metaverse market was valued at USD 68.23 billion in 2021 and it is expected to grow to USD 1527.55 billion by 2029 (Fortune Business insights, 2022). It is expected that 25 percent of the people will

spend at least one hour in the metaverse by 2026 (Gartner, 2022). The metaverse commerce through social media platforms is also expected to grow. The adoption of metaverse by social media companies has increased tremendously as they are increasingly focusing on enhancing the interactions of user on the social media platforms through collaboration, ecommerce and live events using virtual reality and augmented reality (Emergen Research, 2022; Fortune Business insights, 2022; Valuates Reports, 2022). In the future, metaverse commerce as a channel will be facilitated through establishment of communities that will enhance consumer brand engagement and create new revenue channels for the companies (Wongkitrungrueng & Suprawan, 2023; Forbes Council, 2022; Dan Barthiaume, 2022).

The online shopping in metaverse has gained traction and its share in the metaverse market is continuously increasing (Fortune Business Insights, 2022). As the adoption of metaverse grows, more features are going to merge offline shopping with online shopping. The metaverse commerce will give users a highly personalized immersive and seamless experience that will help users to buy the right products at the right

* Corresponding author at: Digital Futures for Sustainable Business & Society Research Group, School of Management, Swansea University, Bay Campus, Fabian Bay, Swansea SA1 8EN Wales, UK

E-mail address: y.k.dwivedi@swansea.ac.uk (Y.K. Dwivedi).

<https://doi.org/10.1016/j.elerap.2024.101381>

Received 29 July 2023; Received in revised form 15 January 2024; Accepted 15 March 2024

Available online 19 March 2024

1567-4223/© 2024 The Author(s). Published by Elsevier B.V. This is an open access article under the CC BY license (<http://creativecommons.org/licenses/by/4.0/>).

time. Although, the Metaverse commerce is in infant stage, it presents companies with unique opportunity to develop virtual content that can be used for conversion of already existing metaverse customers in the virtual platforms into customers in the real world (Dan Barthiaume, May 2022; Wunderman Thompson Intelligence, 2021). Brands like Gucci, Nike, Samsung have already started collaborating with future technology platforms like roblox, decentraland and sandbox. The global fashion brands are launching limited edition fashion items for the virtual spaces. Many brands have also started investing huge amounts of money for virtual land purchase in metaverse platforms for hosting fashion weeks by global brands and creating brand engagement (Tokens.com, Feb 2022). These type of collaborations and investments represent an interplay of virtual and real world. In metaverse the two worlds of commerce- *online world* where one can virtually experience products and *physical world* where one can physically enjoy and use products are converging leading to a new futuristic technology and commerce platform for brand engagement and commerce. (Economic Times, 2021; Credit Suisse, 2022). The objective of the metaverse investments by brands is to engage the young admirers specially Gen Z in the metaverse by placing the products in the virtual spaces and facilitating users to experience the brand and their products in the virtual world and in the long term convert them into loyal customers for the physical versions of the brand/products in the real world. The metaverse as futuristic technology and commerce platform holds potential for marketing, testing, advertising, engagement and selling of the brands and giving rise to “*new virtual to physical commerce model*” (Tan et al., 2023). For example, the brands could have presence of virtual store front with actual employee in virtual avatar (Kim, 2021). The metaverse retail would give users an opportunity to see and try on their favorite brands in 3D before making any purchase decision of the physical version of the product (GSMA, 2022).

Metaverse has led to new value creation and capture opportunities for the brands by creating experiences for the customers. The customers can create their own identity through avatars and communicate with each other. They can experience brands, participate in virtual events, get first-hand information about new products, buy digital versions of the products and experience digital versions of the new products. The metaverse allows customers to design/customize virtual products and engage in co-creation, win rewards and share on social media (Mancuso et al., 2023). This helps brands to build a stronger trusted connection with the customers, enhance brand image and awareness leading to customer attachment in the long run. The literature emphasizes that interactivity in metaverse in terms of active control perceived by the customer, the two-way communication between customers and other stakeholders and the synchronicity of the metaverse platform are some important elements impacting the user attitude and behavior towards the brand on the metaverse platform (Chen et al., 2023; Hennig-Thurau et al., 2023; Riar et al., 2022; de Regt et al., 2021; Hilken et al., 2022; Hilken et al., 2020; Qin et al., 2021; Kowalczyk et al., 2021; Sharma et al., 2021; Fan et al., 2020; Haile & Kang, 2020; McLean & Wilson, 2019; Heller et al., 2019a; b; Wang et al., 2019; Huang et al., 2018).

Metaverse as a futuristic technology tool for developing immersive consumer experience is an important area of research (Kim & Kim, 2024; Pal & Arpikanondt, 2024; Richter & Richter, 2024; Barrera and Shah, 2023; Buhalis et al., 2023; Dwivedi et al., 2023; Wider et al., 2023; Dwivedi et al., 2022; Flavian et al., 2019). Metaverse is a nascent concept. The brand interactivity in metaverse has not been fully understood. It is still unknown how the metaverse brand interactivity viz. perceived active control, two-way communication and synchronicity impact the customers in metaverse and build their trust, knowledge and attachment for the brand. It is still to be explored whether brands are able to actively engage customers in metaverse and whether that can impact purchase intention of physical products in the real world (Dwivedi et al., 2023; Dwivedi et al., 2022; Trivedi, et al., 2022; Chen et al., 2022). Hence this study intends to fill this research gap, by answering the following research questions:

RQ1 What role does metaverse Brand interactivity (perceived active control, perceived two-way communication, perceived synchronicity,) play in enhancing the metaverse brand trust, metaverse brand knowledge and metaverse brand attachment?

RQ2 What role does metaverse brand attachment, metaverse brand knowledge and metaverse brand trust play in the metaverse brand active engagement?

RQ3 How does metaverse brand active engagement impact the consumer purchase intention of the brands and their physical products in the real world?

The remainder of this paper is structured as follows. First, we cover the key relevant literature regarding metaverse brand interactivity, metaverse brand trust, metaverse brand knowledge metaverse brand attachment, metaverse brand active engagement and purchase intention of real world products in context of virtual reality, augmented reality, mixed reality, social media and other online platforms to develop hypothesis and support the research framework. Our methodology and analysis is presented in the ensuing sections. Followed by a discussion of the results, the limitations of the study and avenues for future research have also been addressed.

2. Literature review, research model and hypothesis development

The study used the Stimulus-Organism-Response (S-O-R) framework to develop the research model. S-O-R model was proposed by Mehrabian & Russell (1974) which postulates that environmental stimuli affects a person’s (organism) cognitive responses and affective responses, which further impact their behavioral intentions. In the previous research related to virtual reality, augmented reality and the online platforms, the S-O-R theoretical model has been used extensively. Kim et al. (2020) used S-O-R model to investigate consumer behavioral intentions in VR tourism. Based on the stimulus–organism–response (S–O–R) framework, Wu & Lai (2022) investigated the use of virtual walking tours in mountain to motivate user intention to take a walk in the real world mountains. Lee et al. (2022) used the model to study the consumer adoption of augmented reality enhanced virtual try-ons. According to Chen et al. (2022), interactivity and vividness in virtual reality positively impact telepresence, perceived diagnosticity, and playfulness, thereby triggering consumers’ impulsive buying behavior. Their study utilized the S-O-R framework to provide further support for these relationships. (Aw et al., 2021) studied the impact of smart shopping on web rooming intention using the S-O-R framework. These studies confirm the use of Stimulus- Organism and Response(S-O-R) model in the technology based emerging eco-systems.

The current study conceptualizes that the *Metaverse brand interactivity* dimensions namely perceived active control, perceived two-way communication and perceived synchronicity are the environmental stimuli which will impact the cognitive and affective reaction of the user in term of metaverse brand trust, metaverse brand attachment and metaverse brand knowledge. *Metaverse Brand Active Engagement* influences the response of the user in terms of purchase intention in the real world. The research model is given in Fig. 1. The hypothesis has

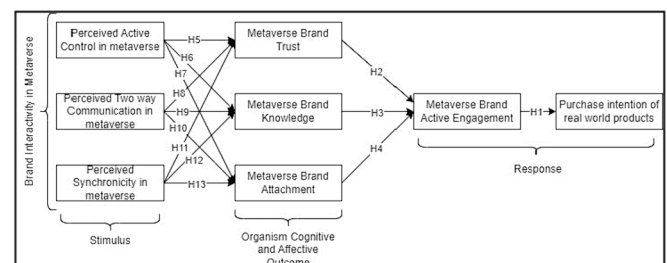


Fig. 1. Research framework (Source: Authors).

been justified in the following sections.

2.1. Brand active engagement in metaverse and consumer purchase intention in real world

Engagement is a multidimensional construct consisting of three dimensions of immersion, passion and activation. Immersion and passion focus on the cognitive aspect while activation focus on the behavioral aspect (Hollebeek, 2011; Hollebeek, 2011). The current research study focuses on “Metaverse Brand Active Engagement” which is the action or behavioral component of brand engagement where the focus is on time, energy and effort spent by the consumer on the brand related activities in the metaverse. According to Brodie et al. (2013), consumer active engagement in virtual brand is a state which is dependent on context. Engagement is dependent on a consumer’s interactions with other users and/or the futuristic technology platforms (Mollen & Wilson, 2010). Engagement has been investigated in different contexts like computer-mediated communication (O’Brien et al., 2018), online product experiences and online services (Khan et al., 2020), gaming platforms (Sharma et al., 2021) or online blogging (Hughes et al., 2019), social media (Bento et al., 2018), social commerce (Bazi et al., 2020) and virtual reality platform/applications (Cowan & Ketron, 2018). Online Engagement of customer on these emerging futuristic technologies oriented immersive platforms is important area of study for researchers and marketers (Arya et al., 2023, de Regt et al., 2021; Rasool et al., 2020; Flavian et al., 2019). Prior research suggests that users holistic experience with technology which is measured through active engagement is important in explaining user behavior (Sung et al., 2022; Riar et al., 2022; Rasool et al., 2020; Cowan & Ketron, 2019; Wong & Merrilees, 2015; Hollebeek, 2011; Hollebeek, 2011). In metaverse, brand active engagement involves customers passionately participating in the virtual events, visiting the experiences created by the brands in the metaverse, participating in the gamified experiences, winning rewards, contributing to the experiences by co-creation and giving feedback.

Literature has studied the purchase intention of the goods in the futuristic technology platforms like metaverse, virtual reality apps and augmented reality apps. The purchase intention has been studied in different virtual contexts by different researchers. Many researchers have studied purchase intention of virtual products on the virtual platforms (Cha, 2011; Uhm et al., 2022). For example, Wu & Hsu (2018) investigated purchase intention of virtual items in the online role-playing game. Huang (2012) and Chen & Chen (2020) studied purchase intention of virtual items in the social networking service game platform. However, there are very few researchers who have studied the purchase intention of real-world products initiated through the metaverse/augmented/virtual experience. Papagiannidis et al. (2014) investigated the purchase intention of a car in real world based on the virtual test driving of a car. A summary of the relevant literature is given in Table 1.

Huang et al. (2012) reported that positive virtual experiences in virtual world positively impact the travel intentions in real life. Abzari et al. (2014) reported that brand experience in social virtual world impacts the purchase intention in real world. Huang (2020) reported that if a user enjoys and engages positively with a virtual reality (VR) technology innovation experience service designed to promote electric two-wheelers, it will positively impact their decision making capability to purchase the product. Wu & Lai (2022) reported that the use of 360-degree virtual mountain walking tours leads to positive experiences in terms of flow, enjoyment and emotional involvement further impacting the audiences’ intention to take a real walking in the mountains. Lee et al. (2022) found that the positive experience in augmented reality enhanced virtual try on impact the behavioral intention. Gabisch (2011) found that purchase intention in real world is motivated by experiences in virtual world. Purchase motivations between the virtual world and the real world are related in the sense that people would bring their needs and wants to the virtual world and buy those products/goods in

Table 1

Summary of literature on Consumer behavioral intention in real world based on futuristic technology platform experiences.

Study	Context	Consumer behavioral Intention in Real World Based on Virtual/Augmented/Online Experiences
Trivedi et al. (2022)	Augmented reality	Purchase intention of real world items is impacted by the use of augmented reality mobile apps
Chen et al (2022)	Augmented reality	Purchase intention is influenced by the customer experience created by the augmented reality apps
(Sung et al., 2022) Mclean & Wilson (2019) (Riar et al., 2021)	Augmented Reality	Augmented reality enables brand engagement leads to enhanced satisfaction which in turn impacts the behavioral intentions towards the brand
Hung et al. (2021)	Augmented Reality	A high level of engagement reinforces the users likelihood of engaging with the brand through futuristic technology platforms like metaverse.
Cowan & Ketron (2020)	Virtual Reality	Consumer engagement on virtual reality applications and platforms impacts the response of the consumers in terms of purchase behavior, worth of mouth, satisfaction and loyalty
(Kaur et al., 2020)	Virtual Community	Consumer brand engagement in virtual communities impacts the consumer response to the brand.
Manchanda & Deb, 2021	Augmented reality	Consumer trust impacts the m-commerce enhanced through usage of augmented reality
Sharma et al. (2021)	Gaming Platform	Perceived Active control significantly impacts the behavioural intention of user on a gaming platform
Fan et al.(2020); (Qin et al., 2021); Wang et al. (2019)	Augmented reality	Interactivity in AR platform influences consumers attitude
(McClure and Seock, 2020)	Social Media	Brand knowledge significantly impacts the consumer involvement with the brand and future purchase intention
Wang et al. (2019)	Massively Multiplayer Online Role-Playing Game	Interactivity of an Massively Multiplayer Online Role-Playing Game impacts the promotion and purchase of virtual goods.
(Carvalho and Fernandes, 2018)	Virtual communities	Trust is an important factor in virtual social network brand communities impacting customer behavior
Akrouf & Nagy (2018)	Virtual communities	Trust impacts the quality of relationship with the brand
(Yi et al., 2015)		The engagement of a user positively and significantly impacts the behavioral intentions on futuristic technology platforms
Papagiannidis, See-To & Bourlakis (2014)	Virtual Reality	The purchase intention of a car in real world is impacted by the virtual Test Driving of a car.
Huang, Backman, & Backman (2012)	Virtual Reality	Positive virtual experiences in virtual world can impact the travel intentions in real life.

the virtual world (Shelton, 2010). This means that we can learn about real world purchase intentions from the virtual purchase behaviors. In the metaverse, customers will get an opportunity to experience, co-create and test digital version of the products or services which may influence them to buy the physical versions of the products or service in

the real world.

Thus, we propose the following hypothesis:

H1: Metaverse Brand Active Engagement significantly impacts the purchase intention of the brand and its products in the real world.

2.2. Metaverse brand trust and metaverse brand active engagement

Brand Trust is defined as the customer's confidence that the brand will act in a particular way (Ha & Perks, 2005; Gefen, 2000). It is created as a result of the continuous positive interactions of the brand with the customers (Akrouf & Nagy, 2018; Garbarino & Johnson, 1999; Morgan & Hunt, 1994). *Metaverse Brand trust can be defined as positive beliefs about the brand developed in the customer mind and heart in the metaverse environment* (Mayer et al., 1995; McKnight et al., 2002). Researchers have emphasized that trust is an important construct and can be a challenge to achieve in online purchase platforms based on internet, social media, virtual reality and augmented reality (Wang & Emurian, 2005; Becerra & Badrinarayanan, 2013; Zhou et al., 2018; Choi, 2019; Wongkitrungrueng & Assarut, 2020; Haumer et al., 2020; Plotkina et al., 2022; Tan & Saraniemi, 2023). Customers experiences and interaction with brand community on metaverse may lead to brand trust creation (Zhang et al., 2023; Flavián et al., 2006; Park et al., 2002; Sashi, 2012).

Trust has a positive and significant impact on the consumer attitude towards the futuristic technology platforms (Luna-Nevarez & McGovern, 2021; Baker, Hubona & Srite, 2019). Previous studies have found that virtual reality shopping environment has a potential for integrating online store functionality with the avatar based physical face to face interaction and building customer trust leading to be preferred by the user over the conventional stores (Papadopoulou, 2007). Previous studies have found that virtual reality shopping environment can help to build trust in benevolence, competence, integrity and predictability of the metaverse store (Papadopoulou, 2007). Trust is an important variable in metaverse environment. Due to the unique characteristics of the metaverse including the fact that users interact with digital avatars, user may feel uncertainty and risk. This can be easily mitigated by developing trust. Trust can alleviate uncertainty and increase sense of security leading to positive behavioral intentions (Luna-Nevarez & McGovern, 2021). If the brands on metaverse are easy to use and responsive, it will lead to high interactivity positively and significantly impacting the trust of user on the platform, which will in turn impact the engagement of the user on the platform (Xue et al., 2020). In the metaverse brands may respond to customers in a positive way through avatars, virtual events, virtual stores, gamified experiences, rewards, co-creation opportunities which will help the customer feel that the brand cares about the consumer which in turn will increase the trust on the brand. Once that trust is build, the customers would actively participate in all the experiences developed by brands in the metaverse (Bhandari and Rodgers, 2020).

Thus, we propose the following hypothesis:

H2: Metaverse Brand Trust significantly impacts Metaverse Brand Active Engagement.

2.3. Metaverse brand knowledge and metaverse brand active engagement

Many researchers have studied brand knowledge in the marketing literature. (Mackay, 2001; Pappu et al., 2005; Esch et al., 2006). *Metaverse Brand knowledge is consumer's cognitive representation of brand or consumer perception of brand in the metaverse* (Peter & Olson, 2001). Keller (2003) considers strength, uniqueness and favorability of the brand that the consumer has in his mind as the brand knowledge. Some researchers have conceptualized brand knowledge as consisting of brand awareness and brand image (Keller, 2003; Keller, 1993). Brand knowledge significantly impacts the consumer involvement with the brand and future purchase intention (McClure and Seock, 2020). The metaverse experiences, events, stores and digital version of the products will let the customer experience the products/services in metaverse which may help to build the customers image, awareness and knowledge of the

brand.

Many researchers have studied the relation between brand knowledge and customer brand engagement in online platforms (Koll & von Wallpach, 2009; Esch et al., 2006; Keller, 2003). The brand knowledge affects the association between the consumer and the brand (Keller, 1993; Dean et al., 2016). The knowledge of the consumer about the brand impacts the response of the consumer towards the brand in terms of for example brand loyalty which in turn impacts the consumer engagement with the brand (Brown & Dacin, 1997; Krishnan, 1996; Del Rio et al., 2001; Hutton, 1997; Park & Srinivasan, 1994; Spears et al., 2006; Esch et al., 2006; Keller, 2003). Relationship between brand knowledge and consumer engagement is studied in different technology contexts like social media (Sashi, 2012), e-commerce, v-commerce, online buying etc. Researchers have suggested to study the relationship between brand knowledge and customer engagement by connecting brands with different and new communication channels to leverage the brand (Keller, 2003). Hence this research proposes to study this relationship in metaverse context. Thus, we propose the following hypothesis:

H3: Metaverse Brand knowledge impacts the Metaverse brand Active engagement.

2.4. Metaverse brand attachment and metaverse brand active engagement

Many researchers have studied brand attachment (Tran et al., 2021; Japutra et al., 2020; Dwivedi et al., 2015; Kaufmann et al., 2016; Park et al., 2010). In the context of this study, *Metaverse Brand attachment can be defined as "the strength of the cognitive and affective bond connecting the brand with the self" in the metaverse* (Malar et al., 2011). It is the how close the consumer feels to the brand in the metaverse (Park et al., 2010; Thomson et al., 2005). In the long run, brand attachment impacts the cognitive, affective and economic outcomes like loyalty, trust, commitment, credibility, engagement, satisfaction and profitability (Ghali, Rather & Khan, 2024; Tran et al., 2021; Japutra et al., 2020; Park et al., 2010; Dwivedi et al., 2015; Kaufmann et al., 2016). Brand attachment influences the consumer engagement in virtual communities and social media platforms (Brodie et al., 2013; Zhou et al., 2012; Ewer et al., 2015).

Brand Attachment has a positive and significant impact on the engagement behaviors among consumers in online platforms. The companies which develop emotional bond with the consumers are able to build loyal trustworthy long-term relationships (Obilo et al., 2021; Bian & Haque, 2020; Arya et al., 2019; Hollebeek, 2011a; Hollebeek, 2011b; Thomson et al., 2005). If a consumer is attached to a brand, they would like to spend their time searching, following, liking, reading and actively engaging in the brand related activities (Lim et al., 2022). They may also intend more towards promoting, advocating and purchasing these brands (Park et al., 2010). In the context of social media platforms, brand attachment can lead to active engagement of the consumer which is reflected in the likes, shares and comments by the consumer on the brand related posts (Rabbaneh et al., 2020). In the metaverse, customers get a chance to have their customized digital identity through avatars, experience brands through games and virtual events and stores and win digital rewards. This may generate an affective and cognitive bond between the customer and brand leading to brand attachment which may in turn enhance the active engagement of customers on the metaverse experience created by the brand. Thus, we propose the following hypothesis:

H4: Metaverse Brand Attachment in metaverse significantly impacts Metaverse Brand Active Engage.

2.5. Metaverse brand interactivity

Many researchers have studied the platform interactivity in virtual reality, augmented reality and other online platforms. Platform interactivity is the user perception of capability of the platform to facilitate

active control, two-way communication and synchronous communication. Many researchers have also studied brand interactivity in marketing literature. Brand interactivity is the user perception of brands capability to facilitate active control, two-way communication and synchronous communication. *Metaverse brand interactivity* is the user perception of capability of a brand to use the metaverse platform to facilitate active control, two-way communication and synchronous communication about the brand (Liu, 2003). *In metaverse, interactivity focuses on the interaction between users and the virtual environment through an avatar* (Kim et al., 2012). Metaverse brand interactivity is a multi-dimensional construct consisting of perceived active control, perceived two-way communication and perceived synchronicity (Liu, 2003). Perceived active control is the perceived ability of the user to voluntarily control their actions in the metaverse. It refers to user's perception of how much control they have in avatar selection, in the movement of the avatar and in the experiences provided by the brand in the metaverse. Perceived two-way communication is the user perception that the metaverse platform can facilitate reciprocal communication with the stakeholders. Perceived synchronicity is the user perception about the how well the metaverse platform can respond to their actions (Liu, 2003).

2.5.1. Perceived active control and brand trust, brand knowledge and brand attachment in metaverse

Previous empirical studies have found that the perceived active control significantly impacts the trust of the user on brands. Huang et al. (2019) through the study of 3d Virtual world found that autonomy in terms of freedom to do things of interest and not to feel pressurized or controlled positively impacts the enjoyment, involvement, focus, attention and the behavioral intentions of the user. Perceived active control in terms of perceived sense of ownership and the reprocess ability of the augmented reality technology system impacts the user experience on the augmented reality system. Positive perceived active control ensures that the user enjoy and feel a personal connection on the AR system (Huang et al., 2019). Perceived active control impacts the attitude of the user towards the online shopping especially the Gen Z (Sun & Wang, 2019). Perceived active control over advertising significantly but negatively impacts the irritation, confusion and deceptiveness felt by the customer towards the advertising through thus building positive user experiences (Ha et al., 2014; Wang & Yao, 2020). In social media shops, perceived active control is a significant influence on the trust of the user (Sembada & Koay, 2021). One of the studies on live streaming commerce reported that perceived active control impacts the trust of the customer (Zhang et al., 2022).

Many researchers have studied the relationship between perceived active control and Brand knowledge (Elsharnouby et al., 2021; Matikiti-Manyeverere et al., 2020; Barreda et al., 2016; Huang et al., 2018). Huang et al. (2018) in his study on virtual communities on social media reported that the interactivity in virtual communities on social media effects the brand knowledge. Siemens et al. (2015) found that perceived active control in a branded racing car video game leads to better brand recall. Elsharnouby et al. (2021) in their study on consumer-brand interaction indicated that perceived active control impacts the brand recall and brand recognition. The perceived active control significantly influences the two dimensions of brand knowledge -brand image and brand awareness (Matikiti-Manyeverere et al., 2020; Barreda et al., 2016; Voorveld et al., 2013). Matikiti-Manyeverere et al. (2020) in their study on guest house brand value found that perceived active control positively influences brand awareness and brand image. In metaverse, user's perception of how much control they have in avatar selection and customization of their identity, in the movement of the avatar and in the experiences provided by the brand in the metaverse, the users will have enhanced brand image and awareness leading to enhanced brand knowledge in metaverse.

Several researchers have found that perceived active control positively impacts the customer attachment with the brand in online

platforms. The perceived active control element of the brand on the websites positively impacts the customer-brand relationship (Voorveld et al., 2013; Li & Fang, 2019; Jun and Yi, 2020). Higher level of interactivity in terms of perceived active control may lead to high levels of consumer attachment (Rajaobelina et al., 2021; Ye et al., 2019; Lowry et al., 2009). According to the study conducted by Lowry et al. (2009) on work group collaboration system, perceived active control impacts the quality of communication with the user leading to positive user attachment. If the user feels in control of his identity and experiences in metaverse, they will have greater bond building with the brand leading to brand attachment. Thus, we propose the following hypothesis:

H5: Perceived Active Control in metaverse significantly impacts the Metaverse Brand Trust.

H6: Perceived Active Control in metaverse significantly impacts the Metaverse Brand Knowledge.

H7: Perceived Active Control in metaverse significantly impacts the Metaverse Brand Attachment.

2.5.2. Perceived two-way communication and brand trust, brand knowledge, brand attachment in metaverse

Trust is one of important variables associated with two-way communication. According to Moorman et al. (1993), trust is "a willingness to rely on an exchange partner in whom one has confidence" (p.82). It is an important component in marketing relationships. Two-way communication has been shown to facilitate trust building (Morgan & Hunt, 1994). Given the lack of proximity and physical form, trust is especially important in online relationships. From this perspective, two-way communication can contribute to trust building in metaverse environment. Trust in online environment depends on honest and transparent communication between the platform and the online peers. Users are able to trust virtual avatars when there is sufficient information to assess their authenticity and reputation (Koles et al., 2024; Turilli et al., 2010). It leads to positive the attitude of the user towards the technology leading to positive user engagement (Ischen et al., 2020.) Perceived Two-way communication positively and significantly impacts the relationship building process of online retail brands thus leading to trust (Yoon et al., 2008).

Many researchers have studied the relationship between perceived two-way communication and brand knowledge in online platforms (Elsharnouby et al., 2021; Matikiti-Manyeverere et al., 2020; Barreda et al., 2016; Huang et al., 2018). Studies on the influence of website interactivity on brand knowledge found that the two-way communication significantly influences the two dimensions of brand knowledge -brand image and brand awareness (Matikiti-Manyeverere et al., 2020; Barreda et al., 2016; Voorveld et al., 2013). Elsharnouby et al. (2021) reported that seamless two-way communication impacts the brand recall and brand recognition in the relationship between consumer and a brand. A study by Liu et al. (2020) on brand equity found that interaction between people and online platforms positively impacts the awareness and image of the online celebrity brand.

Several researchers have found that perceived two-way communication positively impacts the customer attachment with the brand in online platforms. The interactive elements of the brand positively impact the customer-brand relationship (Jun & Yi, 2020). Consumers feels related to a brand if there is continuous flow of communication between the brand and the consumer (Jun & Yi, 2020). Two-way communication or reciprocal communication may lead to high levels of consumer attachment (Rajaobelina et al., 2021; Ye et al., 2019; Wang et al., 2018; Nepomuceno et al., 2014, Lowry et al., 2009). Jun & Yi (2020) in their study on influencer-consumer relationship found that perceived two-way communication between influencer brand and the consumer impacts the emotional bond between brand and the consumer. Thus, we propose the following hypothesis:

H8: Perceived Two-way communication in metaverse significantly impacts the Metaverse Brand Trust.

H9: Perceived Two-way communication in metaverse significantly

impacts the Metaverse Brand Knowledge.

H10: Perceived two-way communication in metaverse significantly impacts the Metaverse Brand Attachment.

2.5.3. Perceived synchronicity and brand Trust, brand Knowledge, brand attachment in metaverse

Previous studies have empirically examined the relationship between perceived synchronicity and the cognitive and affective responses of the user in different research contexts. Perceived Synchronicity positively and significantly impacts the relationship building process of online retail brands (Yoon, Choi & Sohn, 2008). Zhang, Liu, Wang & Zhao (2022) found that in live streaming commerce, perceived synchronicity impacts the trust of the customer. If the futuristic technology platforms are easy to use and responsive, it will lead to high interactivity positively and significantly impacting the trust of user on the platform (Xue, Parker & Hart, 2020). However, Yoon & Youn (2016) in their study on brand experience reported that synchronicity does not impact the relationship quality with the customer or in other words the customer trust on the brand.

Many researchers have studied the relationship between interactivity and brand knowledge (Matikiti-Manyevera et al., 2020; Huang et al., 2018). Elsharnouby et al. (2021) reported that perceived synchronicity impacts the brand recall and brand recognition. Huang et al. (2018) in his study on virtual communities on social media reported that the interactivity in virtual communities on social media effects the brand knowledge. The synchronicity significantly influences the brand awareness (Matikiti-Manyevera et al., 2020). Voorveld et al. (2013) in his study on online brand websites found that synchronicity in terms of responsiveness without delay impacts the brand image.

Several researchers have found that brand synchronicity positively impacts the customer attachment with the brand both in physical and online platforms (Rajaobelina et al., 2021; Japutra, 2020). The synchronicity of the brand positively impacts the quality of the relationship between customer and brand (Voorveld et al., 2013; Jun & Yi, 2020). Consumers feels related to a brand if they fell that the brand is responsive without delay (Voorveld et al., 2013; Jun & Yi, 2020). Higher level of interactivity in terms of synchronicity may lead to high levels of consumer attachment (Rajaobelina et al., 2021; Ye et al., 2019; Wang et al., 2019; Lowry et al., 2009).

Thus, we propose the following hypothesis:

H11: Perceived Synchronicity in metaverse significantly impacts the Metaverse Brand Trust.

H12: Perceived Synchronicity in metaverse significantly impacts the Metaverse Brand Knowledge.

H13: Perceived Synchronicity in metaverse significantly impacts the Metaverse Brand Attachment.

3. Research methodology

3.1. Study experiential space

'Nikeland' in Roblox was chosen as the experiential space for the participants. Nikeland is a virtual space in roblox metaverse which is a simulation of the original Nike headquarters, where consumers can experience virtual products with avatars, buy NFTs and participate in games to earn rewards.

3.2. Study participants

Gen Z are the main adopters of Metaverse (Xue, Parker & Hart, 2020). Hence two hundred and eighty undergraduate and post graduate students of a university were recruited for the study. All the participants had at least one-month experience with Roblox which is one of the successful early versions of metaverse platforms and metaverse economy (Walker, 2022) and has 47 million daily active users globally (Statista, 2023). The participants also had experience with virtual reality

headsets and applications in gaming zones. All of them had used a VR headset and a VR application at least 2 times in the last one year. The respondent profile is given in Table 2.

3.3. Data collection

All the students recruited for the study were supposed to create a signup and login to the Roblox platform and play Nikeland. After a play session of 60 min, the participants were given a questionnaire and asked to respond to the questions based on their experience in the Nikeland. The data collection process was conducted in July 2022.

3.4. Study questionnaire

The study questionnaire consisted of two parts- the first part collected demographic information about the participants and the second part consisted of questions measuring the perception towards study variables. All the items were embraced from published literature and adapted to the metaverse context. They were measured using 5-point Likert scale. Two marketing professors and 3 doctoral scholars who were familiar with the study context "metaverse" were invited to provide their feedback on the wording and appropriateness of the instrument. The questionnaire was refined based on the feedback given by them.

3.5. Measurement items

Measurement items for perceived active control, perceived two-way communication and perceived synchronicity in metaverse were adapted from Liu (2003). Metaverse brand knowledge scale was derived from Algesheimer et al. (2005) and Liu et al. (2020). Metaverse brand trust and metaverse brand attachment were measured by adapting scales from Larzelere & Huston (1980) and Park et al. (2010) respectively. Metaverse brand active engagement was measured based on the research of Osei-Frimpong & McLean (2018). Purchase intention in real world was measured using Fiore et al. (2005). All the items are available in Table 3.

4. Results

The present study hypothesized the relationship to explore the impact of metaverse on purchase intentions in real world. Owing to exploratory nature of the research, we employed partial least Square Method Structural Equation Modelling (PLS-SEM) to predict the model. The advantages of PLS-SEM include dealing with complex relationships, treatment of non-normal data, exploratory research and small sample size (Hair et al., 2011). Past studies on internet research, technology and

Table 2
Respondent profile.

Gender	Number of respondents	
Male	136	56 %
Female	106	44 %
18-24	242	100 %
Highest Qualification		
Class 12th	141	59 %
Undergraduate	74	30 %
Postgraduate	27	11 %
Usage of Roblox/Minecraft/Any other metaverse		
Once	24	10 %
Two to five times	73	30 %
Once a month	21	9 %
Twice a month	22	9 %
Once a week	31	13 %
More than once a week	71	29 %

Table 3

Measurement items.

Code	Item	Reference
PAC	Perceived active control on Metaverse While I follow brands on Metaverse, I have a great deal of control over my experience in the metaverse.	Liu, Y. (2003)
PAC1		
PAC2		
PAC3		
PSYN	Perceived synchronicity on Metaverse While I was using metaverse platform to follow brands, The Metaverse processed my input very quickly	Liu, Y. (2003)
PSYN1		
PSYN2		
PSYN3		
PSYN4		
PTWC	Perceived Two Way Communication on Metaverse While I was using metaverse platform to follow brands,I felt it was effective in gathering visitors' feedback	Liu, Y. (2003)
PTWC1		
PTWC2		
PTWC3		
PTWC4		
BT	Metaverse Brand Trust While I was using metaverse platform to follow brands, I felt that the platform is in general trustworthy	Larzelere & Huston (1980)
BT1		
BT2		
BT3		
BA	Metaverse Brand Attachment On metaverse, I feel that Brand is part of me and who I am	Park et al.(2010)
BA1		
BA2		
BA3		
BK	Metaverse Brand Knowledge When compared to other people, I know a lot about this brand in the metaverse	Algesheimer, Dholakia & Herrmann (2005) Lin, Lin & Wang (2020)
BK1		
BK2		
BK3		
BK4	The brand is nice in the metaverse	

Table 3 (continued)

Code	Item	Reference
BK5	The Brand products have a high quality in the metaverse	
BE	Metaverse Brand Active Engagement I follow companies and their brands using metaverse	Osei-Frimpong & McLean (2018)
BE1		
BE2		
BE3		
PI	Purchase intention in Real World After experiencing the product in the metaverse, it is likely that I would consider to go check the product in the real world.	Fiore et al. (2005)
PI1		
PI2		
PI3		

smart devices have affirmed the advantages of using PLS-SEM in the studies (AlNuaimi et al., 2021; Dash & Paul, 2021). Therefore, to confirm measurement model and verify the hypothesis we have employed PLS-SEM.

4.1. Common method bias

CMB occurs owing to a response error rather than a statistical error (Jordan & Troth, 2020). In this study, the epistemology of metaverse experience and purchase intention is based on the perception and value analysis of users. This might have induced the risk of CMB as Kock et al. (2021) affirm that survey-based self-administered questionnaires are prone to CMB. CMB can be a threat and disintegrate the reliability and validity of the test (Tehseen et al., 2017). Hence, it is important to examine the presence of CMB which can be caused when both independent and dependent are studied in the same survey (Kock, 2017) and can deviate the results. Kock et al. (2021) suggested two methods to control CMB survey-based via procedural and statistical controls. We employed both ways to avoid CMB. Initially, by giving the respondents clear instructions regarding the condition of anonymity of their responses and participation in the survey; presenting the questions after the content validity to avoid complex and ambiguous questions. Secondly, in statistical control, we calculated VIF to examine CMB and found all values less than 3.3. As per Kock (2017), if all the values of VIF are lower than 3.3 then it voids the issues of CMB. Additionally, to address and evaluate the potential common method bias using the VIF (variance inflation factor) collinearity approach within SmartPLS 4, we followed the methodology proposed by Kock (2015) and Kock & Lynn (2012). We introduced a random dependent variable and then calculated the VIF values for all other variables in our model. The purpose of this step was to identify any potential collinearity issues among the variables. Our analysis revealed that all VIF values were found to be below the threshold of 3.3 against the random variable also. This result indicates that there were no significant collinearity problems among the variables. By implementing these rigorous strategies, we aimed to minimize and thoroughly evaluate the impact of common method bias in our research.

4.2. Measurement model

Table 4 reveals the assessment of measurement model to assess

Table 4
Convergent validity.

Variables	Outer loadings	Composite reliability	Cronbach's alpha	AVE
BRAND ATTACHMENT (BA)				
BA1	0.88	0.911	0.937	0.789
BA2	0.896			
BA3	0.907			
BA4	0.87			
PERCEIVED ACTIVE CONTROL (PAC)				
PAC1	0.875	0.851	0.91	0.771
PAC2	0.896			
PAC3	0.863			
PERCEIVED TWO WAY COMMUNICATION (PC)				
PC1	0.881	0.894	0.926	0.758
PC2	0.893			
PC3	0.854			
PC4	0.855			
PUCHASE INTENTIONS IN REAL WORLD (PI)				
PI1	0.88	0.893	0.933	0.824
PI2	0.909			
PI3	0.934			
PERCEIVED SYNCHRONICITY(PS)				
PS1	0.873	0.849	0.893	0.628
PS2	0.884			
PS3	0.905			
PS4	0.828			
BRAND KNOWLEDGE (BK)				
BK1	0.638	0.895	0.927	0.762
BK2	0.827			
BK3	0.853			
BK4	0.836			
BK5	0.787			
BRAND TRUST (PT)				
PT1	0.875	0.83	0.898	0.746
PT2	0.836			
PT3	0.88			
BRAND ACTIVE ENGAGEMENT (BE)				
BE1	0.839	0.831	0.898	0.747
BE2	0.877			
BE3	0.876			

reliability, the values of Cronbach's alpha and average variance explained (AVE). As per Hair et al. (2019), the recommended threshold limits of reliability should be more than 0.7. As per Table 4, all the values of Cronbach's alpha and Composite reliability are more than 0.7 as Cronbach's alpha ranged from 0.898 to 0.937 and composite reliability ranged from 0.830 to 0.911. Therefore, all the reflective values have excellent level of reliability as required and affirms that all measures in respective constructs are have same context and characteristics. Later, it is important to examine the reflection of all the constructs via validity and the present study tested the convergent validity, discriminant validity and predictive validity. To assess the convergent validity, past studies suggested the minimum value that standardized outer loadings of each item should be above 0.7 and AVE should be more than 0.5. In algorithm process, PLS-SEM calculates the outer loading value of all the items and Table 4 reveals that all values are more than 0.7. In bootstrapping process, it has been observed that all the outer loading values are significant at a 1 % level of significance. Furthermore, AVE demonstrates values greater than 0.5, which is as per the recommendation of Fornell and Larcker (1981). Hence, it confirms the convergent validity. To examine the discriminant validity, we considered Fornell-Larcker method, cross-loading value method and HTMT (Hair et al.,

2011). Fornell-Larcker criterion suggests that the AVE of each latent construct should be higher than the construct's highest squared correlation with any other latent construct and in cross loading criteria an indicator's loadings should be higher than all of its cross-loadings (Fornell and Larcker, 1981). Also, using HTMT method we verified that all the values are lower than 0.85 which confirm no issue of discriminant validity (refer to Table 5) (Hair et al., 2017). To assess the predictive validity, we examined Q^2 and R^2 . Q^2 explains the 'predictive competencies' and R^2 explains the 'predictive variance'. According to Table 6, the Q^2 values of all the variables are more than 0.35 which suggest that current relationships have strong predictive strength. R^2 represents the predictive accuracy of the relationships as coefficient of determination. In our case, the antecedents of PS have strong variance as compare to PT and PA. ME also has strong explained variance of 0.536 and PI in real world is also seems to fair with $R^2 = 0.496$.

4.3. Robustness check

Endogeneity is concern in SEM which might roots to errors in measurements, CMB and heterogeneity and therefore, the issue has been taken seriously in marketing (Hult et al., 2018). Hence, it is worth checking in the present study as we have exploratory research. Firstly, we checked the non-normal distribution in the potential variables by Kolmogorov-Smirnov test. It calculated the p-values and as per Sarstedt et al. (2020), the values should be less than 0.05 to affirm that variables are not normally distributed. In the present study, it reveals that p-values < 0.05 and hence, we run gaussian copula for the endogenous variables. After running the multiple copulas in the model, it was found to be non-significant which shows the no issues of endogeneity. Non-linearity was tested using curve estimation regression and RAMSEY (1969) RESET test. It was found that there were no significant non-linear relationships in the structural model.

4.4. Structural model

After conducting the measurement model and checking the robustness of the variables we verified the hypothesis via bootstrapping method (Refer to Table 7 and Fig. 2). The bootstrapping method involves re-sampling techniques and create 5000 sub-samples to examine the relationship in the paths by calculating coefficients, t-values, standard errors and p-values (Hair et al., 2020).

Results as per table 7 demonstrate that the relationship between metaverse brand active engagement and purchase intention in real world ($\beta = 0.708$, t -value = 19.96, p -value < 0.05, $f^2 = 0.982$). Thus H1 is supported. Interestingly, the effect size of the relationship is very high which infers that when consumers are engaged on metaverse they intend to purchase brand from the real world as they acknowledge the presence of the brand while experiencing the metaverse journey of communication, interaction, synchronicity, trust, knowledge and attaching to the brand.

Interestingly, the results show the positive and significant relationship between metaverse brand trust and metaverse brand active engagement ($\beta = 0.203$, t -value = 0.168, p -value < 0.05, $f^2 = 0.027$). It infers that trust of metaverse users possibly engages the users. Hence H2 is supported. Similarly, when everyone is trying to become *meta-savvy* and experience brands in metaverse and enhance brand knowledge, it impacts the metaverse brand active engagement among users ($\beta = 0.297$, t -value = 3.698, p -value < 0.05, $f^2 = 0.07$). Hence H3 is supported. H4 is also supported, which states that metaverse brand attachment impacts metaverse brand active engagement ($\beta = 0.344$, t -value = 4.773, p -value < 0.05, $f^2 = 0.1$).

H5 propound that PAC in metaverse positively influencing the metaverse brand trust ($\beta = 0.170$, t -value = 2.007, p -value < 0.05, $f^2 = 0.03$). It is possible that active and clear control over using metaverse impacts the confidence level of the users and influences the trust. Results suggest that voluntary control on using metaverse is not impacting

Table 5
Divergent validity.

	PAC	BA	BK	PS	PT	PC	PI	BE
PAC	0.878							
BA	0.652	0.888						
BK	0.6	0.753	0.792					
PS	0.662	0.623	0.652	0.873				
PT	0.58	0.683	0.698	0.573	0.864			
PC	0.648	0.716	0.75	0.696	0.728	0.871		
PI	0.588	0.773	0.684	0.624	0.57	0.641	0.908	
BE	0.546	0.682	0.672	0.546	0.608	0.593	0.704	0.864

Table 6
Predictive ability.

	R Square	R Square Adjusted	Q ²
BRAND ATTACHEMENT	0.581	0.576	0.452
BRAND KNOWLEDGE	0.602	0.597	0.367
BRAND TRUST	0.552	0.546	0.402
PUCHASE INTENTION	0.496	0.493	0.401
BRAND ACTIVE ENGAGEMENT	0.536	0.53	0.389

metaverse brand knowledge ($\beta = 0.124$, t -value = 1.686, p -value > 0.05, $f^2 = 0.019$). It is possible that owing to new space, the knowledge of the users is not impacted at all. Therefore, H6 is not supported. In H7, it was proposed that there is a significant relationship between PAC in metaverse and metaverse brand attachment and results reveals that when users have voluntary control over using content on metaverse it might lead to attachment ($\beta = 0.282$, t -value = 3.64, p -value < 0.05, $f^2 = 0.091$). H7 is supported.

Additionally, another antecedent perceived two-way communication in metaverse is found to be positively significant with all consequent i.e. metaverse brand trust, metaverse brand knowledge and metaverse brand attachment which implies that a two-way communication is a key to influence attachment to brands in metaverse, enhance knowledge and generate the trust among users. Being a new and innovative platform, metaverse users learn via user-friendly flow of communication. H8, H9, H10 are supported.

Metaverse is highly interactive, which provides the synchronized experience. However, metaverse is currently in mint condition and unfamiliar with large clusters. Therefore, perceived synchronicity in metaverse is insignificant with metaverse brand attachment and metaverse brand trust and significant with metaverse brand knowledge. It infers that users are at a learning stage and trying to imbibe the metaverse brand knowledge ($\beta = 0.203$, t -value = 2.679, p -value < 0.05, $f^2 =$

Table 7
Hypothesis testing.

	Sample mean (M)	Standard deviation (STDEV)	T statistics (O/STDEV)	P Values	Remarks	F ²
H1 Brand Active Engagement-> Purchase Intention	0.708	0.035	19.96	0	Supported	0.982
H2 Brand Trust -> Brand Active Engagement	0.168	0.069	2.421	0.016	Supported	0.027
H3 Brand Knowledge-> Brand Active Engagement	0.297	0.08	3.698	0	Supported	0.07
H4 Brand Attachment-> Brand Active Engagement	0.344	0.072	4.773	0	Supported	0.1
H5 Perceived Active Control -> Brand Trust	0.17	0.082	2.007	0.045	Supported	0.03
H6 Perceived Active Control -> Brand Knowledge	0.124	0.073	1.686	0.092	Not Supported	0.019
H7 Perceived Active Control -> Brand Attachment	0.282	0.076	3.64	0	Supported	0.091
H8 Perceived Two way communication -> Brand Trust	0.576	0.072	8.038	0	Supported	0.338
H9 Perceived Two way communication -> Brand Knowledge	0.527	0.062	8.605	0	Supported	0.32
H10 Perceived Two way communication -> Brand Attachment	0.445	0.072	6.222	0	Supported	0.216
H11 Perceived Synchronicity -> Brand Trust	0.06	0.074	0.821	0.412	Not Supported	0.004
H12 Perceived Synchronicity -> Brand Knowledge	0.203	0.075	2.679	0.008	Supported	0.045
H13 Perceived Synchronicity -> Brand Attachment	0.127	0.077	1.674	0.095	Not Supported	0.017

0.008). Therefore, H12 is supported. H11 and H13 are not supported.

4.5. Mediation effect

To profoundly examine the direct and indirect relationship among constructs, we proffered metaverse brand active engagement as the mediators in the study. It has been found that metaverse brand active engagement has a partial mediation effect on all the three relationships (Refer to Table 8). First, the relationship between metaverse brand knowledge to purchase intention through metaverse brand active engagement showed positive and significant with $\beta = 0.208$ and, p -value < 0.05 which implies that brand knowledge in Metaverse stimulates intentions to buy brand in real world after engaging with brand in metaverse. Second, the relationship between metaverse brand trust to purchase intention through metaverse brand active engagement is significant ($\beta = 0.117$ and, p -value < 0.05) which implies that trust in brand present in metaverse encourages purchase in real world. Third, the relationship between metaverse brand attachment to purchase

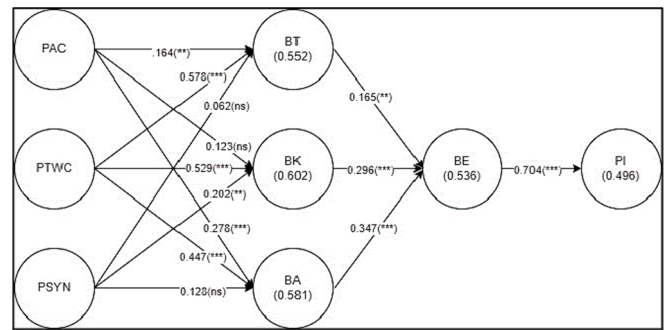


Fig. 2. Structural model.

Table 8
Mediation effects.

Relationship	Indirect effects	P Values	Total Effects	P Values
Brand Knowledge-> Brand Active Engagement -> Purchase Intention	0.208	0	0.208	0
Brand Trust -> Brand Active Engagement-> Purchase Intention	0.117	0.014	0.117	0.008
Brand Attachment-> Brand Active Engagement -> Purchase Intention	0.244	0	0.244	0

intention through metaverse brand active engagement is positively significant ($\beta = 0.244$ and, p -value < 0.05).

4.6. NCA

Necessary Condition Analysis (NCA) is a research methodology and tool that is intended to identify necessary conditions in datasets. NCA is based on the idea of necessary logic, which states that the related result will not occur in the absence of a particular condition. Other considerations are unable to compensate for the lack of an essential condition (Dul et al., 2020; Richter et al., 2020). When combined with other regression-based data analysis approaches, such as partial least squares structural equation modelling (PLS-SEM) and qualitative comparative analysis (QCA), NCA is a useful tool (Sukhov et al., 2023). When the variables and outcomes under study are represented as a variable score, NCA can indicate which predictor or predictors are required and to what extent those predictors are required to reach a given outcome degree. NCA has two main benefits: first, Ceiling lines and bottleneck tables are used to illustrate the links between predictor and outcome variables. Second, in order to prevent calculation errors, it performs significance testing and computes metrics like effect sizes and ceiling line accuracy (Dul, 2016; Dul et al., 2020).

With the use of the CE-FDH (ceiling envelopment with free disposal hull) technique, NCA uses a Cartesian coordinate system to produce stepwise ceiling lines that show whether predictor X is required for outcome Y. Bottleneck tables give a thorough understanding of the parameters that must be met by outlining how predictor X limits outcome Y accuracy (Dul, 2016). Additionally, Dul (2016) presents the broad thresholds between various effect sizes d , where a “small” effect size is defined as $0 < d < 0.1$, a “small” as $0.1 \leq d \leq 0.3$, a “medium” as $0.3 \leq d \leq 0.5$, and a “large” effect size as $0.5 \leq d \leq 1$.

Therefore, to better pinpoint the critical factors that propel Brand Active Engagement in the Metaverse, this study incorporated Necessary Condition Analysis (NCA) alongside PLS-SEM analysis. Our analysis centered on the influence of metaverse brand attachment, metaverse brand knowledge, and metaverse brand trust on driving Brand Active Engagement. The results revealed that metaverse brand knowledge and metaverse brand attachment significantly contribute to metaverse brand active engagement, with medium effect sizes ($d = 0.240$; $P < 0.05$ and $d = 0.178$; $P < 0.05$, respectively). These findings highlight the importance of nurturing metaverse brand knowledge and fostering emotional connections with the brand to promote engagement in the Metaverse. However, metaverse brand trust exhibited to be significant but with lower effect size ($d = 0.025$; $P < 0.05$), suggesting a relatively lesser role in driving metaverse brand active engagement (Refer to Table 9).

To delve deeper into the matter, we conducted a bottleneck analysis as indicated in Table 9, to attain a medium level of Metaverse Brand Active Engagement (40 %), it is essential for brand attachment to reach at least 12.37 %. Achieving a high level of Brand Active Engagement (70 %) necessitates brand attachment to be at least 32.79 % and brand knowledge at 20.69 %. In contrast, for achieving 100 % higher levels of Metaverse engagement, Metaverse brand attachment should reach

Table 9
NCA.

Brand active engagement	Brand attachment	Brand knowledge	Brand trust
0.00 %	NN	NN	NN
10.00 %	NN	NN	NN
20.00 %	NN	NN	NN
30.00 %	NN	0.00 %	NN
40.00 %	12.37 %	0.00 %	NN
50.00 %	12.37 %	0.00 %	NN
60.00 %	12.37 %	0.00 %	NN
70.00 %	32.79 %	20.69 %	NN
80.00 %	54.92 %	20.69 %	NN
90.00 %	54.92 %	94.83 %	NN
100.00 %	54.92 %	94.83 %	70.23 %
NCA Effects	0.178*	0.240*	0.025*

54.92 %, Metaverse brand knowledge should be at 94.83 %, and Metaverse brand trust should be 70.23 %. This signifies that without reaching the minimum threshold of brand attachment (12.37 %), a high level of Brand Active Engagement in the Metaverse will not be realized. These thresholds serve as crucial benchmarks for each factor in driving varying levels of Metaverse Brand Active Engagement. This study sheds light on the key factors that drive metaverse brand active engagement. It emphasizes the significance of metaverse brand knowledge and metaverse brand attachment while highlighting the relatively lesser impact of metaverse brand trust. The findings offer valuable insights and actionable recommendations for brands seeking to enhance their engagement strategies in the dynamic landscape of the metaverse (Dul et al., 2023; Richter and Richter, 2023).

5. Discussion

Currently metaverse is cashing in on its novelty as a channel/platform which is attracting new opportunities for marketers and consumers. There are handful of studies of consumer purchase intentions via metaverse which might impact the future of marketing and advertising and brand engagement (Christodoulou et al., 2022; Koo et al., 2022; Xi et al., 2023). Therefore, it is imperative to examine the pre-adoption behavior of consumer on futuristic technology platform and the present study contributes in the tacitly presented literature of impact of metaverse on buying intentions in real world with opportunities and challenges by exploring the modernist model of consumers purchase intentions in metaverse. Also, to have profound elucidation in the study, we conjectured metaverse brand active engagement as a mediator. Assumed from S-O-R theory, the present study investigates the three mechanisms of metaverse interactivity as stimulus with trust, knowledge and attachment as consumer’s affective and cognitive outcomes and purchase intentions as response.

It has been found that the perceived level of active control within the metaverse positively influences metaverse brand attachment and trust. This implies that the degree of controllability impacts individuals’ trust (Liu & Shrum, 2002). In the metaverse, the use of AR/VR technologies often requires a high degree of control. When users actively engage with this modern platform and engage in experiential learning, it may enhance their attachment to it. Additionally, their ability to navigate these systems may boost their trust in the technology (Wang et al., 2019).

As a result, the metaverse presents an opportunity for marketers to captivate users, enabling them to explore products in novel ways. However, it’s noteworthy that perceived active control in the metaverse is not significantly related to metaverse brand knowledge. This suggests that active control in an emerging platform may not significantly contribute to the development of brand knowledge. Metaverse technology is still evolving and adapting to new innovations, requiring time for users to build brand knowledge. Building Metaverse Brand knowledge often involves user participation (Liu & Shrum, 2002). However, achieving deep user engagement and active involvement is challenging

due to the ever-changing nature of this platform (Xi et al., 2023). The results reveal that the development of metaverse brand knowledge is associated with increased user engagement. This means that brand knowledge is influenced when consumers actively participate and provide input, facilitating their understanding of brands in the metaverse (Han et al., 2022).

Also, it has been revealed that perceived synchronicity is not significantly related to metaverse brand trust and metaverse brand attachment. This presents a challenge for marketers. However, it is significantly associated with brand knowledge. This suggests that while perceived synchronicity in the metaverse can positively impact users' brand knowledge, it may not directly affect brand trust or attachment. This finding aligns with previous studies conducted in the metaverse context, such as Matikiti-Manyeverere et al. (2020), Huang et al. (2018), and Voorveld et al. (2013). In essence, it implies that users are more likely to remember and learn about a brand when they associate it with meaningful and well-timed experiences in the metaverse. This corresponds with the findings of Yoon & Youn (2016), which indicate that there is no significant relationship between perceived synchronicity and metaverse brand trust. This means that even if users perceive brand interactions as synchronized, it may not lead to a substantial change in their level of trust in the brand. Trust may depend on various other factors, such as the brand's reputation, consistency, and reliability.

The findings regarding perceived synchronicity, metaverse brand trust, and metaverse brand attachment, particularly from studies like Rajaobelina et al. (2021), Xue et al. (2020), and Jun & Yi (2020) in the context of the metaverse support the results of current study and indicate that the sense of synchronicity does not significantly influence users' emotional attachment and trust to a brand. Brand attachment may be influenced by other factors, such as the brand's values, emotional resonance, and the overall quality of experiences provided. Therefore, to build trust and attachment in the metaverse, brands should focus on aspects beyond synchronicity. They should prioritize delivering consistent, high-quality experiences, aligning with user values, and creating emotionally resonant interactions.

It is worth noting that perceived two-way communication positively influences all the experience of the consumers as it has been found significant with metaverse brand attachment, metaverse brand knowledge and metaverse brand trust. It is possible that two-ways communication can create opportunities for the marketers to stimulate the trust, knowledge and attachment to know the brands via futuristic platforms among new age consumers (Hollensen et al., 2022). Additionally, consumer experience via metaverse brand trust, metaverse brand knowledge and metaverse brand attachment effects the metaverse brand active engagement. As per the results all the variables are significant and captivating the users via AR/VR and other technologies on metaverse. The study confirmed that brand trust is an important construct in online purchase platforms based on internet, social media, virtual reality and augmented reality (Wang & Emurian, 2005; Becerra & Badrinarayanan, 2013; Zhou et al., 2018; Choi, 2019; Wongkitrungrueng & Assarut, 2020; Haumer et al., 2020; Plotkina et al., 2022). Another important finding of the study was that metaverse brand knowledge impacts metaverse brand active engagement. This is in line with the findings of (McClure and Seock, 2020) who emphasized that brand knowledge significantly impacts the consumer involvement with the brand. The study affirms that brand attachment influences the consumer engagement in virtual communities and social media platforms which is in line with the results of previous researchers (Brodie et al., 2013; Zhou et al., 2012; Ewer et al., 2015). Finally, the study affirmed that metaverse brand active engagement positively influence the purchase intentions of brand products in real world. The result is in agreement with those obtained by Shelton (2010), Gabisch (2011), Huang et al. (2012), Abzari et al. (2014), Papagiannidis et al. (2014), Huang (2020), Wu & Lai (2022) and Lee, Xu & Porterfield (2022). The researchers support the idea that positive virtual experiences can positively impact the behavioral intentions in the real life. Purchase motivations between the virtual

world and the real world are related in the sense that people would bring their needs and wants to the virtual world, experience the brands that satisfy those needs and wants in the virtual world and buy those products/goods in the real world (Shelton, 2010). It is a good opportunity for the marketers to target the new age consumers whom are open to the explore futuristic platforms for shopping.

6. Theoretical and practical implications

This study theoretically contributes to the extant literature in the following ways. The paper is one of the first papers to study the impact of metaverse brand active engagement on purchase intention of brands in the real world. The study throws light on the concept of metaverse brand interactivity, metaverse brand trust, metaverse brand attachment, metaverse brand knowledge and brand active engagement. The study extends the brand management literature by investigating metaverse as a brand communication, marketing and advertising channel. The study also confirms the stimulus-organism-response framework given by Mehrabian & Russell (1974).

The papers contribute to the practical aspects of brand active engagement in metaverse environment. Metaverse brand active engagement can be supported by the brand managers by marketing and advertising in metaverse. Digital bill boards can be used for advertising in metaverse either by renting metaverse space or by creating own billboards in the metaverse. These are effective way of advertising as they are interactive, immersive and can be strategically placed to woo the right target consumers. Non-fungible tokens (NFT) can be used to create unique collectibles of brands and their popular commercials (Bao et al., 2024). They can also be used to access virtual reality or augmented reality-based campaigns of the brand. Metaverse Brand Managers can create interactive immersive virtual experiences such as virtual events, virtual games, virtual quizzes or virtual tours in the metaverse to encourage their customers to engage with the brand in a metaverse setting. Such metaverse settings or experiences can also share content about the brand products and services which can in turn enhance the metaverse brand knowledge among the customers. The experiences can be personalized to the meet individual needs and preferences of the customers to foster stronger emotional connection with the customers in the metaverse. The emotional connection can further be strengthened by providing virtual customer service through avatars or agents and responding to customer queries and concerns in real time in metaverse. Brand managers can create channels in metaverse to support frequent feedback and reviews. This will demonstrate that the brand values its customers and is willing to hear and address their concerns. This can lead to high levels of brand trust and brand attachment among the customers. Brand managers can participate in metaverse industry events, metaverse conferences and collaborate with metaverse influencers and industry experts. These efforts can foster brand interactivity, brand attachment, brand trust and brand knowledge among the customers and create a context for brand active engagement in the metaverse world.

Metaverse brand active engagement can also be supported through retailing in metaverse. Retailers can consider how to provide extra value to products, services and distinctive experience through metaverse platforms. Retailers may, for example, have virtual stores with virtual avatars or agents in metaverse or offer loyal consumers metaverse accessories as gifts or items or NFT when they purchase. This will help to create brand knowledge, brand trust and brand attachment among customers through retailing in metaverse. This will have a positive impact on the consumer's attitude towards retail commerce in metaverse as well as in real world (Dwivedi et al., 2023; Koochang et al., 2023). Retailers that are pursuing a omni-channel strategy should start to consider how *meta*-commerce can become an integral part of their overall approach.

Metaverse brand active engagement can be supported by the brand managers by marketing research efforts in metaverse. Data can be

collected about consumer from metaverse as well as the devices connected to metaverse. This can help to analyze customer perception, preferences and sentiment and identify the consumer purchase heuristics on metaverse as well as in real world (Dwivedi et al., 2023; Koohang et al., 2023). Metaverse can also be used to test different products and services to understand the consumer reaction. As the metaverse is in infancy and is still evolving, the brand managers/retailers/advertisers and market researchers will need to continuously plan, design, redesign and improvise their branding strategies as per the viable opportunities continuously being made available through the technological advancement in the futuristic metaverse platform.

Also, Necessary condition analysis hold significant implications for practitioners and marketers operating in the Metaverse. The study underscores the importance of focusing on metaverse brand knowledge and cultivating meaningful metaverse brand attachments. This entails providing relevant information and creating emotional connections with the target audience to foster active engagement. By investing in these areas, brands can enhance their presence and establish a strong foundation for user engagement in the virtual world. While metaverse brand trust is found to have a relatively lesser impact, it should still be considered as an important factor. Building trustworthiness and credibility can contribute to overall brand engagement in the metaverse, reinforcing the importance of maintaining transparent and reliable interactions with users. Therefore, the bottleneck analysis conducted in the study offers practical insights by determining the specific thresholds required for achieving desired levels of engagement. This information can assist brands in setting realistic goals and devising strategies tailored to meet those thresholds.

7. Limitations, future research directions and conclusion

This study has several limitations which lead to future research directions. First, data for the study was collected from Gen Z users active on one single brand virtual space in the metaverse. The research can be extended to other age cohorts and other brands on the metaverse platform. Second, data was collected through questionnaires. In the future research, data can be collected through devices connected to metaverse. The study follows a cross-sectional research design. Future studies can employ experimental or longitudinal research design. Technological factors and flow factors, personality factors can be studied in the research studies to generate knowledge in that area. The study contributes to the metaverse research emphasizing that metaverse can be one of the most promising futuristic platforms for brand engagement through variety of marketing, advertising, branding and market research efforts. Currently the metaverse is in infancy stage and the metaverse efforts can be evolved by the marketing and advertising managers, retailers and market research professionals as per the advancements in the technology (haptics, atmospheric, immersion, interactivity) in the metaverse world (Dwivedi et al., 2023; Koohang et al., 2023).

CRedit authorship contribution statement

Ruchi Payal: Writing – review & editing, Writing – original draft, Visualization, Validation, Software, Resources, Project administration, Methodology, Investigation, Formal analysis, Data curation, Conceptualization. **Nitika Sharma:** Writing – review & editing, Writing – original draft, Visualization, Validation, Software, Resources, Project administration, Methodology, Investigation, Formal analysis, Data curation, Conceptualization. **Yogesh K. Dwivedi:** Writing – review & editing, Writing – original draft, Supervision, Conceptualization.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence

the work reported in this paper.

Data availability

Data will be made available on request.

References

- Abzari, M., Ghassemi, R.A., Vosta, L.N., 2014. Analyzing the effect of social media on brand attitude and purchase intention: The case of Iran Khodro company. *Procedia Soc. Behav. Sci.* 143, 822–826. <https://doi.org/10.1016/j.sbspro.2014.07.483>.
- Akrout, H., Nagy, G., 2018. Trust and commitment within a virtual brand community: The mediating role of brand relationship quality. *Inf. Manage.* 55 (8), 939–955. <https://doi.org/10.1016/j.im.2018.04.009>.
- Algesheimer, R., Dholakia, U.M., Herrmann, A., 2005. The social influence of brand community: Evidence from European car clubs. *J. Mark.* 69 (3), 19–34. <https://doi.org/10.1509/jmk.69.3.19.66363>.
- Alnuaimi, M., Alzoubi, H.M., Ajelat, D., Alzoubi, A.A., 2021. Towards intelligent organisations: An empirical investigation of learning orientation's role in technical innovation. *Int. J. Innov. Learn.* 29 (2), 207–221. <https://doi.org/10.1504/IJIL.2021.112996>.
- Arya, V., Verma, H., Sethi, D., Agarwal, R., 2019. Brand authenticity and brand attachment: How online communities built on social networking vehicles moderate the consumers' brand attachment. *IIM Kozhikode Soc. Manage. Rev.* 8 (2), 87–103. <https://doi.org/10.1177/2277975219825508>.
- Arya, V., Sambyal, R., Sharma, A., Dwivedi, Y.K., 2023. Brands are calling your AVATAR in Metaverse—A study to explore XR-based gamification marketing activities & consumer-based brand equity in virtual world. *J. Consumer Behav.* <https://doi.org/10.1002/cb.2214>.
- Aw, E.C.X., Basha, N.K., Ng, S.I., Ho, J.A., 2021. Searching online and buying offline: Understanding the role of channel-, consumer-, and product-related factors in determining webrooming intention. *J. Retail. Consum.* 58, 102328. <https://doi.org/10.1016/j.jretconser.2020.102328>.
- Baker, E.W., Hubona, G.S., Srite, M., 2019. Does “being there” matter? The impact of web-based and virtual world's shopping experiences on consumer purchase attitudes. *Inf. Manage.* 56 (7), 103153 <https://doi.org/10.1016/j.im.2019.02.008>.
- Bao, W., Hudders, L., Yu, S., Beuckels, E., 2024. Virtual luxury in the metaverse: NFT-enabled value recreation in luxury brands. *Int. J. Res. Mark.* <https://doi.org/10.1016/j.ijresmar.2024.01.002>.
- Barreda, A.A., Bilgihan, A., Nusair, K., Okumus, F., 2016. Online branding: Development of hotel branding through interactivity theory. *Tour. Manage.* 57, 180–192. <https://doi.org/10.1016/j.tourman.2016.06.007>.
- Barrera, K.G., Shah, D., 2023. Marketing in the Metaverse: Conceptual understanding, framework, and research agenda. *J. Bus. Res.* 155, 113420 <https://doi.org/10.1016/j.jbusres.2022.113420>.
- Bazi, S., Hajli, A., Hajli, N., Shanmugam, M., Lin, X., 2020. Winning engaged consumers: The rules of brand engagement and intention of co-creation in social commerce. *Inf. Technol. People* 33 (2), 456–476. <https://doi.org/10.1108/ITP-09-2018-0415>.
- Becerra, P.E., Badrinarayanan, V., 2013. The influence of brand trust and brand identification on brand evangelism. *J. Product Brand Manage.* 22 (5/6), 371–383. <https://doi.org/10.1108/JPBM-09-2013-0394>.
- Bento, M., Martinez, L.M., Martinez, L.F., 2018. Brand engagement and search for brands on social media: Comparing generations X and Y in Portugal. *J. Retail. Consum. Services* 43, 234–241. <https://doi.org/10.1016/j.jretconser.2018.04.003>.
- Bhandari, M., Rodgers, S., 2020. What does the brand say? Effects of brand feedback to negative eWOM on brand trust and purchase intentions. *Int. J. Advert.* 37 (1), 125–141. <https://doi.org/10.1080/02650487.2017.1349030>. Routledge.
- Bian, X., Haque, S., 2020. Counterfeit versus original patronage: Do emotional brand attachment, brand involvement, and past experience matter? *J. Brand Manage.* 27 (4), 438–451. <https://doi.org/10.1057/s41262-020-00189-4>.
- Brodie, R.J., Ilic, A., Juric, B., Hollebeek, L., 2013. Consumer engagement in a virtual brand community: An exploratory analysis. *J. Bus. Res.* 66 (1), 105–114. <https://doi.org/10.1016/j.jbusres.2011.07.029>.
- Brown, T.J., Dacin, P.A., 1997. The company and the product: Corporate associations and consumer product responses. *J. Mark.* 61 (1), 68–84. <https://doi.org/10.1177/002224299706100106>.
- Buhalis, D., Leung, D., Lin, M., 2023. Metaverse as a disruptive technology revolutionizing tourism management and marketing. *Tour. Manage.* 97, 104724 <https://doi.org/10.1016/j.tourman.2023.104724>.
- Carvalho, A., Fernandes, T., 2018. Understanding customer brand engagement with virtual social communities: A comprehensive model of drivers, outcomes and moderators. *J. Mark. Theory Pract.* 26 (1–2), 23–37. <https://doi.org/10.1080/10696679.2017.1389241>.
- Cha, J., 2011. Exploring the internet as a unique shopping channel to sell both real and virtual items: A comparison of factors affecting purchase intention and consumer characteristics. *J. Electronic Commerce Res.* 12 (2), 115. <http://www.jecr.org/node/71>.
- Chen, H., Chen, H., 2020. Understanding the relationship between online self-image expression and purchase intention in SNS games: A moderated mediation investigation. *Comput. Hum. Behav.* 112, 106477 <https://doi.org/10.1016/j.chb.2020.106477>.
- Chen, S.C., Chou, T.H., Hongsuchon, T., Ruangkanjanases, A., Kittikowit, S., Lee, T.C., 2022. The mediation effect of marketing activities toward augmented reality: The

- perspective of extended customer experience. *J. Hospitality Tour. Technol.* 13 (3), 461–480. <https://doi.org/10.1108/JHTT-03-2021-0093>.
- Chen, J.V., Ha, Q.A., Vu, M.T., 2023. The influences of virtual reality shopping characteristics on consumers' impulse buying behavior. *Int. J. Hum.-Comput. Interact.* 39 (17), 3473–3491. <https://doi.org/10.1080/10447318.2022.2098566>.
- Choi, Y.K., 2019. Characters' persuasion effects in advergaming: Role of brand trust, product involvement, and trust propensity. *Internet Res.* 29 (2), 367–368. <https://doi.org/10.1108/IntR-01-2018-0021>.
- Christodoulou, K., Katalaris, L., Themistocleous, M., Christodoulou, P., Iosif, E. (2022). NFTs and the metaverse revolution: research perspectives and open challenges. *Blockchains and the Token Economy: Theory and Practice*, 139–178. doi: 10.1007/978-3-030-95108-5_6.
- Cowan, K., Ketrone, S., 2019. A dual model of product involvement for effective virtual reality: The roles of imagination, co-creation, telepresence, and interactivity. *J. Bus. Res.* 100, 483–492. <https://doi.org/10.1016/j.jbusres.2018.10.063>.
- Credit Suisse (2022). What is the metaverse and how will the evolution of the Internet change our daily lives?. Available: <https://www.credit-suisse.com/about-us-news/en/articles/securities-research-reports/report-4-202205.html>.
- Dan Barthiaume (May, 2022). What do consumers want from metaverse commerce?. Available at: <https://chainstoreage.com/what-do-consumers-want-metaverse-commerce>.
- Dan Barthiaume (April, 2022) Survey: Metaverse commerce poised for growth. Available at: <https://www.chainstoreage.com/survey-metaverse-commerce-poised-growth>.
- Dash, G., Paul, J., 2021. CB-SEM vs PLS-SEM methods for research in social sciences and technology forecasting. *Technol. Forecast. Soc. Change* 173, 121092.. <https://doi.org/10.1016/j.techfore.2021.121092>.
- de Regt, A., Plangger, K., Barnes, S.J., 2021. Virtual reality marketing and customer advocacy: Transforming experiences from story-telling to story-doing. *J. Bus. Res.* 136, 513–522. <https://doi.org/10.1016/j.jbusres.2021.08.004>.
- Dean, D., Arroyo-Gamez, R.E., Punjaisri, K., Pich, C., 2016. Internal brand co-creation: The experiential brand meaning cycle in higher education. *J. Bus. Res.* 69 (8), 3041–3048. <https://doi.org/10.1016/j.jbusres.2016.01.019>.
- Del Rio, A.B., Vazquez, R., Iglesias, V., 2001. The role of the brand name in obtaining differential advantages. *J. Product Brand Manage.* 10 (7), 452–465. <https://doi.org/10.1108/EUM00000000006242>.
- Dul, J., Van der Laan, E., Kuik, R., 2020. A statistical significance test for necessary condition analysis. *Organiz. Res. Methods* 23 (2), 385–395. <https://doi.org/10.1177/1094428118795272>.
- Dul, J., Hauff, S., Bouncken, R.B., 2023. Necessary condition analysis (NCA): Review of research topics and guidelines for good practice. *Rev. Manage. Sci.* 17 (2), 683–714.. <https://doi.org/10.1007/s11846-023-00628-x>.
- Dul, J., 2016. Necessary condition analysis (NCA) logic and methodology of “necessary but not sufficient” causality. *Organiz. Res. Methods* 19 (1), 10–52. <https://doi.org/10.1177/1094428115584005>.
- Dwivedi, Y.K., Wastell, D., Laumer, S., Henriksen, H.Z., Myers, M.D., Bunker, D., Elbanna, A., Ravishankar, M.N., Srivastava, S.C., 2015. Research on information systems failures and successes: Status update and future directions. *Inf. Syst. Front.* 17, 143–157. <https://doi.org/10.1007/s10796-014-9500-y>.
- Dwivedi, Y.K., Hughes, L., Baabdullah, A.M., Ribeiro-Navarrete, S., Giannakis, M., Al-Debei, M.M., Wamba, S.F., 2022. Metaverse beyond the hype: Multidisciplinary perspectives on emerging challenges, opportunities, and agenda for research, practice and policy. *Int. J. Inf. Manage.* 66, 102542 <https://doi.org/10.1016/j.ijinfomgt.2022.102542>.
- Dwivedi, Y.K., Hughes, L., Wang, Y., Alalwan, A.A., Ahn, S.J., Balakrishnan, J., Wirtz, J., 2023. Metaverse marketing: How the metaverse will shape the future of consumer research and practice. *Psychol. Mark.* 40 (4), 750–776. <https://doi.org/10.1002/mar.21767>.
- Economic Times (2021): What is the metaverse and why is everyone talking about it? Available at: <https://economictimes.indiatimes.com/tech/technology/what-is-the-metaverse-and-why-is-everyone-talking-about-it/articleshow/86173493.cms?from=mdr>.
- Elsharnouby, M.H., Mohsen, J., Saeed, O.T., Mahrous, A.A., 2021. Enhancing resilience to negative information in consumer-brand interaction: The mediating role of brand knowledge and involvement. *J. Res. Interact. Mark.* 15 (4), 571–591. <https://doi.org/10.1108/JRIM-05-2020-0107>.
- Emergen Research (2022). Metaverse Report. Available at: <https://www.emergenresearch.com/industry-report/metaverse-market>.
- Esch, F.R., Langner, T., Schmitt, B.H., Geus, P., 2006. Are brands forever? How brand knowledge and relationships affect current and future purchases. *J. Product Brand Manage.* 15 (2), 98–105. <https://doi.org/10.1108/10610420610658938>.
- Ewer, M., Veale, R., Quester, P. (2015, December). Virtual world, real engagement: building brand attachment via hosted brand community online events. In *Looking Forward, Looking Back: Drawing on the Past to Shape the Future of Marketing: Proceedings of the 2013 World Marketing Congress* (pp. 845–848). Cham: Springer International Publishing. doi: 10.1007/978-3-319-24184-5_205.
- Fan, X., Chai, Z., Deng, N., Dong, X., 2020. Adoption of augmented reality in online retailing and consumers' product attitude: A cognitive perspective. *J. Retail. Consumer Services* 53, 101986. <https://doi.org/10.1016/j.jretconser.2019.101986>.
- Fiore, A.M., Kim, J., Lee, H.H., 2005. Effect of image interactivity technology on consumer responses toward the online retailer. *J. Interact. Mark.* 19 (3), 38–53. <https://doi.org/10.1002/dir.20042>.
- Flavian, C., Ibáñez-Sánchez, S., Orús, C., 2019. The impact of virtual, augmented and mixed reality technologies on the customer experience. *J. Bus. Res.* 100, 547–560. <https://doi.org/10.1016/j.jbusres.2018.10.050>.
- Flavián, C., Guinalú, M., Gurrea, R., 2006. The role played by perceived usability, satisfaction and consumer trust on website loyalty. *Information & Management* 43 (1), 1–14. <https://doi.org/10.1016/j.im.2005.01.002>.
- Forbes Council (2022). How The Metaverse Will Reshape E-Commerce Forever. <https://www.forbes.com/sites/theyec/2022/01/24/how-the-metaverse-will-reshape-e-commerce-forever/?sh=4fc881ff69d9>.
- Fornell, C., Larcker, D.F., 1981. Evaluating structural equation models with unobservable variables and measurement error. *J. Mark. Res.* 18 (1), 39–50. <https://doi.org/10.1177/002224378101800104>.
- Fortune Business Insights (2022). Metaverse Report. Available at: <https://www.fortunebusinessinsights.com/metaverse-market-106574>.
- Gabisch, J.A., 2011. Virtual world brand experience and its impact on real world purchasing behavior. *J. Brand Manage.* 19, 18–32. <https://doi.org/10.1057/bm.2011.29>.
- Garbarino, E., Johnson, M.S., 1999. The different roles of satisfaction, trust, and commitment in customer relationships. *J. Mark.* 63 (2), 70–87. <https://doi.org/10.1177/002224299906300205>.
- Gartner (2022). Metaverse Hype to Transition into New Business Models that Extend Digital Business. Press release (February). <https://www.gartner.com/en/newsroom/press-releases/2022-02-07-gartner-predicts-25-percent-of-people-will-spend-at-least-one-hour-per-day-in-the-metaverse-by-2026>.
- Gefen, D., 2000. E-commerce: the role of familiarity and trust. *Omega* 28 (6), 725–737. [https://doi.org/10.1016/S0305-0483\(00\)00021-9](https://doi.org/10.1016/S0305-0483(00)00021-9).
- Ghali, Z., Rather, R.A., Khan, I., 2024. Investigating metaverse marketing-enabled consumers' social presence, attachment, engagement and (re) visit intentions. *J. Retail. Consum. Services* 77, 103671. <https://doi.org/10.1016/j.jretconser.2023.103671>.
- GSMA (2022). Exploring the metaverse and digital future. GSMA Association. <https://www.gsma.com/asia-pacific/wp-content/uploads/2022/02/270222-Exploring-the-metaverse-and-the-digital-future.pdf>.
- Ha, H.Y., Perks, H., 2005. Effects of consumer perceptions of brand experience on the web: Brand familiarity, satisfaction and brand trust. *J. Consum. Behav.* 4 (6), 438–452. <https://doi.org/10.1002/cb.29>.
- Ha, Y.W., Park, M.C., Lee, E., 2014. A framework for mobile SNS advertising effectiveness: User perceptions and behaviour perspective. *Behav. Inf. Technol.* 33 (12), 1333–1346. <https://doi.org/10.1080/0144929X.2014.928906>.
- Haile, T.T., Kang, M., 2020. Mobile augmented reality in electronic commerce: investigating user perception and purchase intent amongst educated young adults. *Sustainability* 12 (21), 9185. <https://doi.org/10.3390/su12219185>.
- Hair, J.F., Ringle, C.M., Sarstedt, M., 2011. The use of partial least squares (PLS) to address marketing management topics. *J. Mark. Theory Pract.* 19 (2), 135–138.
- Hair Jr, J.F., Matthews, L.M., Matthews, R.L., Sarstedt, M., 2017. PLS-SEM or CB-SEM: Updated guidelines on which method to use. *Int. J. Multivariate Data Analysis* 1 (2), 107–123. <https://doi.org/10.1504/IJMDA.2017.087624>.
- Hair, J.F., Risher, J.J., Sarstedt, M., Ringle, C.M., 2019. When to use and how to report the results of PLS-SEM. *Eur. Bus. Rev.* 31 (1), 2–24. <https://doi.org/10.1108/EBR-11-2018-0203>.
- Hair Jr, J.F., Howard, M.C., Nitzl, C., 2020. Assessing measurement model quality in PLS-SEM using confirmatory composite analysis. *J. Bus. Res.* 109, 101–110. <https://doi.org/10.1016/j.jbusres.2019.11.069>.
- Han, D.I.D., Bergs, Y., Moorhouse, N., 2022. Virtual reality consumer experience escapes: Preparing for the metaverse. *Virtual Reality* 26 (4), 1443–1458. <https://doi.org/10.1007/s10055-022-00641-7>.
- Haumer, F., Kolo, C., Reiners, S., 2020. The impact of augmented reality experiential marketing on brand equity and buying intention. *J. Brand Strategy* 8 (4), 368–387.
- Heller, J., Chylinski, M., de Ruyter, K., Mahr, D., Keeling, D.I., 2019a. Let me imagine that for you: Transforming the retail frontline through augmenting customer mental imagery ability. *J. Retail.* 95 (2), 94–114. <https://doi.org/10.1016/j.jretai.2019.03.005>.
- Heller, J., Chylinski, M., de Ruyter, K., Mahr, D., Keeling, D.I., 2019b. Touching the intangible: Exploring multi-sensory augmented reality in the context of online retailing. *J. Retail.* 95 (4), 219–234. <https://doi.org/10.1016/j.jretai.2019.10.008>.
- Hennig-Thurau, T., Aliman, D.N., Herting, A.M., Cziesho, G.P., Linder, M., Kübler, R.V., 2023. Social interactions in the metaverse: Framework, initial evidence, and research roadmap. *J. Acad. Mark. Sci.* 51 (4), 889–913.
- Hilken, T., Keeling, D.I., de Ruyter, K., Mahr, D., Chylinski, M., 2020. Seeing eye to eye: social augmented reality and shared decision making in the marketplace. *J. Acad. Mark. Sci.* 48 (2), 143–164. <https://doi.org/10.1007/s11747-019-00688-0>.
- Hilken, T., Chylinski, M., Keeling, D.I., Heller, J., de Ruyter, K., Mahr, D., 2022. How to strategically choose or combine augmented and virtual reality for improved online experiential retailing. *Psychol. Mark.* 39 (3), 495–507. <https://doi.org/10.1002/mar.21600>.
- Hollebeek, L., 2011a. Exploring customer brand engagement: definition and themes. *J. Strategic Mark.* 19 (7), 555–573. <https://doi.org/10.1080/0965254X.2011.599493>.
- Hollebeek, L., 2011b. Demystifying customer brand engagement: Exploring the loyalty nexus. *J. Mark. Manage.* 27 (7–8), 785–807. <https://doi.org/10.1080/0267257X.2010.500132>.
- Hollensen, S., Kotler, P., Opresnik, M.O., 2022. Metaverse—the new marketing universe. *J. Bus. Strategy.* <https://doi.org/10.1108/JBS-01-2022-0014>.
- Huang, Y.C., Backman, S.J., Backman, K.F., 2012. Exploring the impacts of involvement and flow experiences in second life on people's travel intentions. *J. Hospital. Tour. Technol.* 3 (1), 4–23. <https://doi.org/10.1108/17579881211206507>.
- Huang, T.K., Liao, C.Y., Wang, Y.T., Lin, K.Y. (2018). How does social media interactivity affect brand loyalty?. <https://scholarspace.manoa.hawaii.edu/items/16ce3258-4f7e-407b-bba4-7e8bb0afd7fc>.

- Huang, Y.C., Backman, S.J., Backman, K.F., McGuire, F.A., Moore, D., 2019a. An investigation of motivation and experience in virtual learning environments: A self-determination theory. *Educ. Inf. Technol.* 24 (1), 591–611. <https://doi.org/10.1007/s10639-018-9784-5>.
- Huang, T.L., Mathews, S., Chou, C.Y., 2019b. Enhancing online rapport experience via augmented reality. *J. Services Mark.* 33 (7), 851–865. <https://doi.org/10.1108/JSM-12-2018-0366>.
- Huang, E., 2012. Online experiences and virtual goods purchase intention. *Internet Res.* 22 (3), 252–274. <https://doi.org/10.1108/10662241211235644>.
- Huang, F.H., 2020. Adapting UTAUT2 to assess user acceptance of an e-scooter virtual reality service. *Virtual Reality* 24 (4), 635–643. <https://doi.org/10.1007/s10055-019-00424-7>.
- Hughes, C., Swaminathan, V., Brooks, G., 2019. Driving brand engagement through online social influencers: An empirical investigation of sponsored blogging campaigns. *J. Mark.* 83 (5), 78–96. <https://doi.org/10.1177/0022242919854374>.
- Hult, G.T.M., Hair Jr, J.F., Proksch, D., Sarstedt, M., Pinkwart, A., Ringle, C.M., 2018. Addressing endogeneity in international marketing applications of partial least squares structural equation modeling. *J. Int. Mark.* 26 (3), 1–21. <https://doi.org/10.1509/jim.17.0151>.
- Hung, S.W., Chang, C.W., Ma, Y.C., 2021. A new reality: Exploring continuance intention to use mobile augmented reality for entertainment purposes. *Technol. Soc.* 67, 101757. <https://doi.org/10.1016/j.techsoc.2021.101757>.
- Hutton, J.G., 1997. A study of brand equity in an organizational-buying context. *J. Product Brand Manage.* 6 (6), 428–439. <https://doi.org/10.1108/10610429710190478>.
- Ischen, C., Araujo, T., van Noort, G., Voorveld, H., Smit, E., 2020. "I am here to assist you today": The role of entity, interactivity and experiential perceptions in chatbot persuasion. *J. Broadcasting Electronic Media* 64 (4), 615–639. <https://doi.org/10.1080/08838151.2020.1834297>.
- Japutra, A., 2020. The relations among attachment styles, destination attachment and destination satisfaction. *Curr. Issues Tour.* 23 (3), 270–275. <https://doi.org/10.1080/13683500.2019.1639640>.
- Jordan, P.J., Troth, A.C., 2020. Common method bias in applied settings: The dilemma of researching in organizations. *Austral. J. Manage.* 45 (1), 3–14. <https://doi.org/10.1177/0312896219871976>.
- Jun, S., Yi, J., 2020. What makes followers loyal? The role of influencer interactivity in building influencer brand equity. *J. Product Brand Manage.* 29 (6), 803–814. <https://doi.org/10.1108/JPBM-02-2019-2280>.
- Kang, D.Y., Ki, E.J., 2024. Relationship cultivation strategies in the metaverse. *Public Relat. Rev.* 50 (1), 102397.
- Kaufmann, H.R., Petrovici, D.A., Gonçalves Filho, C., Ayres, A., 2016. Identifying moderators of brand attachment for driving customer purchase intention of original vs counterfeit of luxury brands. *J. Bus. Res.* 69 (12), 5735–5747. <https://doi.org/10.1016/j.jbusres.2016.05.003>.
- Kaur, P., Dhir, A., Chen, S., Malibari, A., Almotairi, M., 2020. Why do people purchase virtual goods? A uses and gratification (U&G) theory perspective. *Telematics Informatics* 53, 101376. <https://doi.org/10.1016/j.tele.2020.101376>.
- Keller, K.L., 1993. Conceptualizing, measuring, and managing customer-based brand equity. *J. Mark.* 57 (1), 1–22. <https://doi.org/10.1177/0022242993057001>.
- Keller, K.L., 2003. Brand synthesis: The multidimensionality of brand knowledge. *J. Consum. Res.* 29 (4), 595–600. <https://doi.org/10.1086/346254>.
- Khan, I., Hollebeek, L.D., Fatma, M., Islam, J.U., Rahman, Z., 2020. Brand engagement and experience in online services. *J. Services Mark.* 34 (2), 163–175. <https://doi.org/10.1108/JSM-03-2019-0106>.
- Kim, Y., Kim, B., 2024. How do the news media, academia, and the public view the metaverse? Evidence from South Korea. *Technol. Forecast. Soc. Change* 198, 122980. <https://doi.org/10.1016/j.techfore.2023.122980>.
- Kim, J., Spielmann, N., McMillan, S.J., 2012. Experience effects on interactivity: Functions, processes, and perceptions. *J. Bus. Res.* 65 (11), 1543–1550. <https://doi.org/10.1016/j.jbusres.2011.02.038>.
- Kim, M.J., Lee, C.K., Jung, T., 2020. Exploring consumer behavior in virtual reality tourism using an extended stimulus-organism-response model. *J. Travel Res.* 59 (1), 69–89. <https://doi.org/10.1177/0047287518818915>.
- Kim, J., 2021. Advertising in the Metaverse: Research agenda. *J. Interact. Advert.* 21 (3), 141–144. <https://doi.org/10.1080/15252019.2021.2001273>.
- Kock, N., Lynn, G.S., 2012. Lateral collinearity and misleading results in variance-based SEM: An illustration and recommendations. *J. Assoc. Inf. Syst.* 13 (7), 546–580. <https://aisel.aisnet.org/jais/vol13/iss7/2>.
- Kock, F., Berbekova, A., Assaf, A.G., 2021. Understanding and managing the threat of common method bias: Detection, prevention and control. *Tour. Manage.* 86, 104330. <https://doi.org/10.1016/j.tourman.2021.104330>.
- Kock, N., 2015. Common method bias in PLS-SEM: A full collinearity assessment approach. *Int. J. e-Collab. (ijec)* 11 (4), 1–10. <https://doi.org/10.4018/ijec.2015100101>.
- Kock, N. (2017). Common method bias: a full collinearity assessment method for PLS-SEM. *Partial least squares path modeling: Basic concepts, methodological issues and applications*, 245–257. doi: 10.1007/978-3-319-64069-3_11.
- Koles, B., Audrezet, A., Moulard, J.G., Ameen, N., McKenna, B., 2024. The authentic virtual influencer: Authenticity manifestations in the metaverse. *J. Bus. Res.* 170, 114325.
- Koll, O., von Wallpach, S., 2009. One brand perception? Or many? The heterogeneity of intra-brand knowledge. *J. Product Brand Manage.* 18 (5), 338–345. <https://doi.org/10.1108/10610420910981819>.
- Koo, D.M., Kim, J., Kim, T., 2022. Guest editorial: Digital transformation and consumer experience. *Internet Res.* 32 (3), 967–970. <https://doi.org/10.1108/INTR-04-2022-684>.
- Koohang, A., Nord, J., Ooi, K., Tan, G., Al-Emran, M., Aw, E., Wong, L., 2023. Shaping the metaverse into reality: Multidisciplinary perspectives on opportunities, challenges, and future research. *J. Comput. Inf. Syst.* <https://doi.org/10.1080/08874417.2023.2165197>.
- Kowalczyk, P., Siepmann, C., Adler, J., 2021. Cognitive, affective, and behavioral consumer responses to augmented reality in e-commerce: A comparative study. *J. Bus. Res.* 124, 357–373. <https://doi.org/10.1016/j.jbusres.2020.10.050>.
- Krishnan, H.S., 1996. Characteristics of memory associations: A consumer-based brand equity perspective. *Int. J. Res. Mark.* 13 (4), 389–405. [https://doi.org/10.1016/S0167-8116\(96\)00021-3](https://doi.org/10.1016/S0167-8116(96)00021-3).
- Larzelere, R.E., Huston, T.L., 1980. The dyadic trust scale: Toward understanding interpersonal trust in close relationships. *J. Marriage Family* 42 (3), 595–604. <https://doi.org/10.2307/351903>.
- Lee, H., Xu, Y., Porterfield, A., 2022. Antecedents and moderators of consumer adoption toward AR-enhanced virtual try-on technology: A stimulus-organism-response approach. *Int. J. Consum. Stud.* 46 (4), 1319–1338. <https://doi.org/10.1111/ijcs.12760>.
- Lim, W.M., Rasul, T., Kumar, S., Ala, M., 2022. Past, present, and future of customer engagement. *J. Bus. Res.* 140, 439–458. <https://doi.org/10.1016/j.jbusres.2021.11.014>.
- Lin, Y.H., Lin, F.J., Wang, K.H., 2021. The effect of social mission on service quality and brand image. *J. Bus. Res.* 132, 744–752. <https://doi.org/10.1016/j.jbusres.2020.10.054>.
- Liu, Y., Shrum, L.J., 2002. What is interactivity and is it always such a good thing? Implications of definition, person, and situation for the influence of interactivity on advertising effectiveness. *J. Advert.* 31 (4), 53–64. <https://doi.org/10.1080/00913367.2002.10673685>.
- Liu, C., Zhang, Y., Zhang, J., 2020. The impact of self-congruity and virtual interactivity on online celebrity brand equity and fans' purchase intention. *J. Product Brand Manage.* 29 (6), 783–801. <https://doi.org/10.1108/JPBM-11-2018-2106>.
- Liu, Y., 2003. Developing a scale to measure the interactivity of websites. *J. Advert.* Res. 43 (2), 207–216. <https://doi.org/10.1017/S0021849903030204>.
- Lowry, P.B., Romano, N.C., Jenkins, J.L., Guthrie, R.W., 2009. The CMC interactivity model: How interactivity enhances communication quality and process satisfaction in lean-media groups. *J. Manage. Inf. Syst.* 26 (1), 155–196. <https://doi.org/10.2753/MIS0742-1222260107>.
- Luna-Nevarez, C., McGovern, E., 2021. The rise of the virtual reality (VR) marketplace: Exploring the antecedents and consequences of consumer attitudes toward V-commerce. *J. Internet Commerce* 20 (2), 167–194. <https://doi.org/10.1080/15332861.2021.1875766>.
- Mackay, M.M., 2001. Evaluation of brand equity measures: Further empirical results. *J. Product Brand Manage.* 10 (1), 38–51. <https://doi.org/10.1108/10610420110382812>.
- Malar, L., Krohmer, H., Hoyer, W.D., Nyffenegger, B., 2011. Emotional brand attachment and brand personality: The relative importance of the actual and the ideal self. *J. Mark.* 75 (4), 35–52. <https://doi.org/10.1509/jmk.75.4.35>.
- Manchanda, M., Deb, M., 2021. On m-commerce adoption and augmented reality: A study on apparel buying using m-commerce in Indian context. *J. Internet Commerce* 20 (1), 84–112. <https://doi.org/10.1080/15332861.2020.1863023>.
- Mancuso, I., Petruzzelli, A.M., Panniello, U., 2023a. Digital business model innovation in metaverse: How to approach virtual economy opportunities. *Inf. Process. Manage.* 60 (5), 103457. <https://doi.org/10.1016/j.ipm.2023.103457>.
- Mancuso, I., Petruzzelli, A.M., Panniello, U., Nespoli, C., 2023b. A microfoundation perspective on business model innovation: The cases of Roblox and meta in metaverse. *IEEE Trans. Eng. Manage.* <https://doi.org/10.1109/TEM.2023.3275198>.
- Matikiti-Manyever, R., Roberts-Lombard, M., Mpinganjira, M., 2020. Perceived guest house brand value: The influence of web interactivity on brand image and brand awareness. *J. Promot. Manage.* 27 (2), 250–277. <https://doi.org/10.1080/10496491.2020.1829770>.
- Mayer, R.C., Davis, J.H., Schoorman, F.D., 1995. An integrative model of organizational trust. *Acad. Manage. Rev.* 20 (3), 709–734. <https://doi.org/10.5465/amr.1995.9508080335>.
- McClure, C., Seock, Y.K., 2020. The role of involvement: Investigating the effect of brand's social media pages on consumer purchase intention. *J. Retail. Consum. Serv.* 53, 101975. <https://doi.org/10.1016/j.jretconser.2019.10.0175>.
- McKnight, D.H., Choudhury, V., Kacmar, C., 2002. The impact of initial consumer trust on intentions to transact with a web site: a trust building model. *J. Strateg. Inf. Syst.* 11 (3–4), 297–323. [https://doi.org/10.1016/S0963-8687\(02\)00020-3](https://doi.org/10.1016/S0963-8687(02)00020-3).
- McLean, G., Wilson, A., 2019. Shopping in the digital world: Examining customer engagement through augmented reality mobile applications. *Comput. Hum. Behav.* 101, 210–224. <https://doi.org/10.1016/j.chb.2019.07.002>.
- Mehrabian, A., Russell, J.A., 1974. *An Approach to Environmental Psychology*. MIT, Cambridge, MA.
- Mollen, A., Wilson, H., 2010. Engagement, telepresence and interactivity in online consumer experience: Reconciling scholastic and managerial perspectives. *J. Bus. Res.* 63 (9–10), 919–925. <https://doi.org/10.1016/j.jbusres.2009.05.014>.
- Moorman, C., Deshpande, R., Zaltman, G., 1993. Factors affecting trust in market research relationships. *J. Mark.* 57 (1), 81–101. <https://doi.org/10.1177/002224299305700106>.
- Morgan, R.M., Hunt, S.D., 1994. The commitment-trust theory of relationship marketing. *J. Mark.* 58 (3), 20–38. <https://doi.org/10.1177/002224299405800302>.
- Nepomuceno, M.V., Laroche, M., Richard, M.O., 2014. How to reduce perceived risk when buying online: The interactions between intangibility, product knowledge, brand familiarity, privacy and security concerns. *J. Retail. Consumer Services* 21 (4), 619–629. <https://doi.org/10.1016/j.jretconser.2013.11.006>.

- Obilo, O.O., Chefor, E., Saleh, A., 2021. Revisiting the consumer brand engagement concept. *J. Bus. Res.* 126, 634–643. <https://doi.org/10.1016/j.jbusres.2019.12.023>.
- Osei-Frimpong, K., McLean, G., 2018. Examining online social brand engagement: A social presence theory perspective. *Technol. Forecast. Soc. Change* 128, 10–21. <https://doi.org/10.1016/j.techfore.2017.10.010>.
- O'Brien, H.L., Cairns, P., Hall, M., 2018. A practical approach to measuring user engagement with the refined user engagement scale (UES) and new UES short form. *Int. J. Hum.-Comput. Stud.* 112, 28–39. <https://doi.org/10.1016/j.ijhcs.2018.01.004>.
- Pal, D., Arpnikanondt, C., 2024. The sweet escape to metaverse: Exploring escapism, anxiety, and virtual place attachment. *Comput. Hum. Behav.* 150, 107998 <https://doi.org/10.1016/j.chb.2023.107998>.
- Papadopoulou, P., 2007. Applying virtual reality for trust-building e-commerce environments. *Virtual Reality* 11 (2), 107–127. <https://doi.org/10.1007/s10055-006-0059-x>.
- Papagiannidis, S., See-To, E., Bourlakis, M., 2014. Virtual test-driving: The impact of simulated products on purchase intention. *J. Retail. Consum. Services* 21 (5), 877–887. <https://doi.org/10.1016/j.jretconser.2014.02.010>.
- Pappu, R., Quester, P.G., Cooksey, R.W., 2005. Consumer-based brand equity: Improving the measurement—empirical evidence. *J. Product Brand Manage.* 14 (3), 143–154. <https://doi.org/10.1108/10610420510601012>.
- Park, C.S., Srinivasan, V., 1994. A survey-based method for measuring and understanding brand equity and its extendibility. *J. Mark. Res.* 31 (2), 271–288. <https://doi.org/10.1177/002224379403100210>.
- Park, J.W., Kim, K.H., Kim, J., 2002. Acceptance of brand extensions: Interactive influences of product category similarity, typicality of claimed benefits, and brand relationship quality. *ACR North American Adv.*
- Park, C.W., MacInnis, D.J., Priester, J., Eisingerich, A.B., Iacobucci, D., 2010. Brand attachment and brand attitude strength: Conceptual and empirical differentiation of two critical brand equity drivers. *J. Mark.* 74 (6), 1–17. <https://doi.org/10.1509/jmk.74.6.1>.
- Peter, J. Paul and Jerry C. Olson (2001), *Consumer Behavior*, Chicago: Irwin.
- Plotkina, D., Dinsmore, J., Racat, M., 2022. Improving service brand personality with augmented reality marketing. *J. Services Mark.* 36 (6), 781–799. <https://doi.org/10.1108/JSM-12-2020-0519>.
- Qin, H., Peak, D.A., Prybutok, V., 2021. A virtual market in your pocket: How does mobile augmented reality (MAR) influence consumer decision making? *J. Retail. Consumer Services* 58, 102337. <https://doi.org/10.1016/j.jretconser.2020.102337>.
- Rabbanee, F.K., Roy, R., Spence, M.T., 2020. Factors affecting consumer engagement on online social networks: Self-congruity, brand attachment, and self-extension tendency. *Eur. J. Mark.* 54 (6), 1407–1431. <https://doi.org/10.1108/EJM-03-2018-0221>.
- Rajaobelina, L., Tep, S.P., Arcand, M., Ricard, L., 2021. The relationship of brand attachment and mobile banking service quality with positive word-of-mouth. *J. Product Brand Manage.* 30 (8), 1162–1175. <https://doi.org/10.1108/JPBM-02-2020-2747>.
- Ramsey, J.B., 1969. Tests for specification errors in classical linear least-squares regression analysis. *J. Royal Stat. Soc. Ser. B Stat. Methodol.* 31 (2), 350–371. <https://doi.org/10.1111/j.2517-6161.1969.tb00796.x>.
- Rasool, A., Shah, F.A., Islam, J.U., 2020. Customer engagement in the digital age: A review and research agenda. *Curr. Opin. Psychol.* 36, 96–100. <https://doi.org/10.1016/j.copsyc.2020.05.003>.
- Riar, M., Korbel, J.J., Xi, N., Zarnekow, R., Hamari, J., 2021. The use of augmented reality in retail: A review of literature. <http://hdl.handle.net/10125/70689>.
- Riar, M., Xi, N., Korbel, J.J., Zarnekow, R., Hamari, J., 2022. Using augmented reality for shopping: A framework for AR induced consumer behavior, literature review and future agenda. *Internet Res.* <https://doi.org/10.1108/INTR-08-2021-0611> (ahead-of-print).
- Richter, S., Richter, A., 2023. What is novel about the metaverse? *Int. J. Inf. Manage.* 73, 102684 <https://doi.org/10.1016/j.ijinfomgt.2023.102684>.
- Richter, S., Richter, A., 2024. Understanding the Metaverse through Four Sociotechnical Dimensions. *Information Matters* 4 (2). <https://dx.doi.org/10.2139/ssrn.4765025>.
- Richter, N.F., Schubring, S., Hauff, S., Ringle, C.M., Sarstedt, M., 2020. When predictors of outcomes are necessary: Guidelines for the combined use of PLS-SEM and NCA. *Ind. Manage. Data Syst.* 120 (12), 2243–2267. <https://doi.org/10.1108/IMDS-11-2019-0638>.
- Sarstedt, M., Ringle, C.M., Cheah, J.H., Ting, H., Moisescu, O.I., Radomir, L., 2020. Structural model robustness checks in PLS-SEM. *Tour. Econ.* 26 (4), 531–554. <https://doi.org/10.1177/1354816618823921>.
- Sashi, C.M., 2012. Customer engagement, buyer-seller relationships, and social media. *Management Decision* 50 (2), 253–272. <https://doi.org/10.1108/002517412112033551>.
- Sembada, A.Y., Koay, K.Y., 2021. How perceived behavioral control affects trust to purchase in social media stores. *J. Bus. Res.* 130, 574–582. <https://doi.org/10.1016/j.jbusres.2019.09.028>.
- Sharma, R., Singh, G., Sharma, S., 2021. Competitors' envy, gamers' pride: An exploration of gamers' divergent behavior. *Psychol. Mark.* 38 (6), 965–980. <https://doi.org/10.1002/mar.21469>.
- Shelton, A.K., 2010. Defining the lines between virtual and real world purchases: Second life sells, but who's buying? *Comput. Hum. Behav.* 26 (6), 1223–1227. <https://doi.org/10.1016/j.chb.2010.03.019>.
- Siemens, J.C., Smith, S., Fisher, D., 2015. Investigating the effects of active control on brand recall within in-game advertising. *J. Interact. Advert.* 15 (1), 43–53.
- Spears, N., Brown, T.J., Dacin, P.A., 2006. Assessing the corporate brand: The unique corporate association valence (UCAV) approach. *J. Brand Manage.* 14 (1), 5–19. <https://doi.org/10.1057/palgrave.bm.2550051>.
- Statista (February 2023). Daily active users (DAU) of Roblox games worldwide from 4th quarter 2018 to 4th quarter 2022. <https://www.statista.com/statistics/1192573/daily-active-users-global-roblox/>.
- Sukhov, A., Friman, M., Olsson, L.E., 2023. Unlocking potential: An integrated approach using PLS-SEM, NCA, and fsQCA for informed decision making. *J. Retail. Consum. Services* 74, 103424. <https://doi.org/10.1016/j.jretconser.2023.103424>.
- Sung, E., Han, D.I.D., Choi, Y.K., 2022. Augmented reality advertising via a mobile app. *Psychol. Mark.* 39 (3), 543–558. <https://doi.org/10.1002/mar.21632>.
- Tan, T.M., Saraniemi, S., 2023. Trust in blockchain-enabled exchanges: Future directions in blockchain marketing. *J. Acad. Mark. Sci.* 51 (4), 914–939. <https://doi.org/10.1007/s11747-022-00889-0>.
- Tan, G.W.H., Aw, E.C.X., Cham, T.H., Ooi, K.B., Dwivedi, Y.K., Alalwan, A.A., Tan, T.M., 2023. Metaverse in marketing and logistics: the state of the art and the path forward. *Asia Pac. J. Mark. Logist.* 35 (12), 2932–2946. <https://doi.org/10.1108/APJML-01-2023-0078>.
- Tehseen, S., Ramayah, T., Sajilan, S., 2017. Testing and controlling for common method variance: A review of available methods. *J. Manage. Sci.* 4 (2), 142–168. <https://doi.org/10.20547/jms.2014.1704202>.
- Thomson, M., MacInnis, D.J., Whan Park, C., 2005. The ties that bind: Measuring the strength of consumers' emotional attachments to brands. *J. Consum. Psychol.* 15 (1), 77–91. https://doi.org/10.1207/s15327663jcp1501_10.
- Tokens.com (Feb 2022). Metaverse Media. Available at: https://www.tokens.com/metaverse-media?1b8c38da_page=2.
- Tran, T.P., Furner, C.P., Albinsson, P.A., 2021. Understanding drivers and outcomes of brand attachment in mobile branded apps. *J. Consum. Mark.* 38 (1), 113–124. <https://doi.org/10.1108/JCM-02-2020-3657>.
- Trivedi, J., Kasilingam, D., Arora, P., Soni, S., 2022. The effect of augmented reality in mobile applications on consumers' online impulse purchase intention: The mediating role of perceived value. *J. Consum. Behav.* 21 (4), 896–908. <https://doi.org/10.1002/cb.2047>.
- Turilli, M., Vaccaro, A., Taddeo, M., 2010. The case of online trust. *Knowl. Technol. Policy* 23, 333–345. <https://doi.org/10.1007/s12130-010-9117-5>.
- Uhm, J.P., Kim, S., Do, C., Lee, H.W., 2022. How augmented reality (AR) experience affects purchase intention in sport E-commerce: Roles of perceived diagnosticity, psychological distance, and perceived risks. *J. Retail. Consum. Services* 67, 103027. <https://doi.org/10.1016/j.jretconser.2022.103027>.
- Valuates Report (2022). Global Metaverse Market Size, Status and Forecast 2022 – 2028. Available at: <https://reports.valuates.com/market-reports/QYRE-Auto-13Y7748/global-metaverse>.
- Voorveld, H.A., Van Noort, G., Duijn, M., 2013. Building brands with interactivity: The role of prior brand usage in the relation between perceived website interactivity and brand responses. *J. Brand Manage.* 20, 608–622. <https://doi.org/10.1057/bm.2013.3>.
- Wang, Y.D., Emurian, H.H., 2005. An overview of online trust: Concepts, elements, and implications. *Comput. Hum. Behav.* 21 (1), 105–125. <https://doi.org/10.1016/j.chb.2003.11.008>.
- Wang, Y., Yao, M.Z., 2020. Did you notice the ads? Examining the influence of telepresence and user control on the effectiveness of embedded billboard ads in a VR racing game. *J. Interact. Advert.* 20 (3), 258–272. <https://doi.org/10.1080/15252019.2020.1846642>.
- Wang, D., Yang, Z., Ding, Z., 2019. Is sociability or interactivity more effective for enhancing performance? Findings from a massively multiplayer online role-playing game. *J. Interact. Mark.* 48 (1), 106–119. <https://doi.org/10.1016/j.intmar.2019.06.002>.
- Wider, W., Jiang, L., Lin, J., Fauzi, M.A., Li, J., Chan, C.K., 2023. Metaverse chronicles: A bibliometric analysis of its evolving landscape. *Int. J. Hum.-Comput. Interact.* 1-14 <https://doi.org/10.1080/10447318.2023.2227825>.
- Wong, H.Y., Merrilees, B., 2015. An empirical study of the antecedents and consequences of brand engagement. *Mark. Intell. Plann.* 33 (4), 575–591. <https://doi.org/10.1108/MIP-08-2014-0145>.
- Wongkitrungrueng, A., Assarut, N., 2020. The role of live streaming in building consumer trust and engagement with social commerce sellers. *J. Bus. Res.* 117, 543–556. <https://doi.org/10.1016/j.jbusres.2018.08.032>.
- Wongkitrungrueng, A., Suprawan, L., 2023. Metaverse meets branding: Examining consumer responses to immersive brand experiences. *Int. J. Hum.-Comput. Interact.* 1-20 <https://doi.org/10.1080/10447318.2023.2175162>.
- Wu, S.L., Hsu, C.P., 2018. Role of authenticity in massively multiplayer online role playing games (MMORPGs): Determinants of virtual item purchase intention. *J. Bus. Res.* 92, 242–249. <https://doi.org/10.1016/j.jbusres.2018.07.035>.
- Wu, X., Lai, I.K.W., 2022. The use of 360-degree virtual tours to promote mountain walking tourism: Stimulus–organism–response model. *Inf. Technol. Tour.* 24 (1), 85–107. <https://doi.org/10.1007/s40558-021-00218-1>.
- Wunderman Thompson Intelligence (2021). New Trend Report: The future 100:2021. Available at: <https://www.vml.com/insight/new-trend-report-the-future-100-2021>.
- Xi, N., Chen, J., Gama, F., Riar, M., Hamari, J., 2023. The challenges of entering the metaverse: An experiment on the effect of extended reality on workload. *Inf. Syst. Front.* 25 (2), 659–680. <https://doi.org/10.1007/s10796-022-10244-x>.
- Xue, L., Parker, C.J., Hart, C., 2020. How to design fashion retail's virtual reality platforms. *Int. J. Retail Distribut. Manage.* 48 (10), 1057–1076. <https://doi.org/10.1108/IJRDM-11-2019-0382>.
- Ye, B.H., Barreda, A.A., Okumus, F., Nusair, K., 2019. Website interactivity and brand development of online travel agencies in China: The moderating role of age. *J. Bus. Res.* 99, 382–389. <https://doi.org/10.1016/j.jbusres.2017.09.046>.
- Yi, C., Jiang, Z., Benbasat, I., 2015. Enticing and engaging consumers via online product presentations: The effects of restricted interaction design. *J. Manag. Inf. Syst.* 31 (4), 213–242. <https://doi.org/10.1080/07421222.2014.1001270>.

- Yoon, D., Youn, S., 2016. Brand experience on the website: Its mediating role between perceived interactivity and relationship quality. *J. Interact. Advert.* 16 (1), 1–15. <https://doi.org/10.1080/15252019.2015.1136249>.
- Yoon, D., Choi, S.M., Sohn, D., 2008. Building customer relationships in an electronic age: The role of interactivity of E-commerce Web sites. *Psychol. Mark.* 25 (7), 602–618. <https://doi.org/10.1002/mar.20227>.
- Zhang, M., Liu, Y., Wang, Y., Zhao, L., 2022. How to retain customers: Understanding the role of trust in live streaming commerce with a socio-technical perspective. *Comput. Hum. Behav.* 127, 107052 <https://doi.org/10.1016/j.chb.2021.107052>.
- Zhang, L., Anjum, M.A., Wang, Y., 2023. The impact of trust-building mechanisms on purchase intention towards metaverse shopping: The moderating role of age. *Int. J. Hum.-Comput. Interact.* 1-19 <https://doi.org/10.1080/10447318.2023.2184594>.
- Zhou, Z., Zhang, Q., Su, C., Zhou, N., 2012. How do brand communities generate brand relationships? Intermediate mechanisms. *J. Bus. Res.* 65 (7), 890–895. <https://doi.org/10.1016/j.jbusres.2011.06.034>.
- Zhou, W., Tsigas, Z., Li, B., Zheng, S., Jiang, S., 2018. What influence users' e-finance continuance intention? The moderating role of trust. *Ind. Manage. Data Syst.* 118 (8), 1647–1670. <https://doi.org/10.1108/IMDS-12-2017-0602>.