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Conceptualization and Development of a Scale for Brand Experience in Extended Reality

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ABSTRACT

Purpose: This study aims to conceptualize the brand experience that users' avatars can experience on an XR platform and develop items to measure it.

Design/methodology/approach: The author presents both a conceptual analysis of brand experience in XR (BXIXR) and a BXIXR scale by conducting a review of marketing research and immersive technology. Adhering to the relevant theory and psychometric principles, the BXIXR scale was developed and validated through a literature review and item generation process, followed by confirmatory factor analysis, reliability analysis, and predictive validity testing. **Findings:** This research demonstrates that BXIXR can be broken down into four dimensions that are differentially evoked by various brand spaces in XR: search, entertainment, relations, and assembly.

Research limitations/implications: This research suggested that the brand experience that users have at the boundary between the physical and virtual worlds may differ from brand experience in the physical world. In this study, it is expected that meaningful implications can be proposed in that it attempts to derive a brand experience based on an immersive economy.

Originality/value: The results of this study suggest that the BXIXR scale is a reliable and valid measure of BXIXR. The four-factor structure of the scale is consistent with the theoretical framework, and the results of the reliability and validity testing provide evidence for its robustnes.

Keywords: Extended reality, Brand experience, Virtual store, Immersive technology, Engagement

I. Introduction

Recently, numerous Metaverse-related studies have been published, and a range of information related to the Metaverse is constantly being produced through social media (Baek, 2021; Barnes & Mattsson, 2011, 2015; Dionisio et al., 2013; Fan et al., 2020; Huang et al., 2021; Jeon, 2021; Lee et al., 2011; Shen et al., 2021). However, academics and practitioners often still view the Metaverse as simply a game based on 3D technology. Prior research has generally focused on the Metaverse's functional advancement, while studies on user experiences in the Metaverse are rare (Guilbaud et al., 2021; Han, 2019; Kim & Hall, 2019; McLean & Wilson, 2019; Wright et al., 2008). Although the Metaverse platform has the potential to lead the immersive economy beyond the experience economy, discussion on the concept has been relatively sparse (Jeon, 2021; Lee et al., 2011).

The immersive economy and the experience economy

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are related concepts; however, some differences exist between them. The term "immersive economy" is used to describe a collection of organizations working to develop and apply immersive technologies to create economic, social, and cultural value. These immersive technologies go beyond traditional formats for interacting with digital information, immersing users in digitally generated or enhanced realities. The technologies that contribute to the immersive economy include virtual reality (VR), augmented reality (AR), and other related technologies (Mateos-Garcia et al., (2018). The experience economy refers to an economic model in which businesses seek to create memorable experiences for their customers as a way of generating value. These experiences are designed to engage the senses, create emotional connections, and provide a high degree of personalization (Pine & Gilmore, 1999). In summary, while the experience economy and the immersive economy share some similarities in terms of creating engaging and memorable experiences, the immersive economy is focused specifically on using immersive technologies, while the experience economy is a broader concept that encompasses a wide range of industries and approaches to create experiences.

Since the onset of the coronavirus disease 2019 (COVID-19) pandemic in late 2019, many people have shifted their daily activities, such as shopping and cultural events, from the physical world to online spaces (Gupta et al., 2019). In particular, extended reality (XR) technologies, including AR and VR, are playing increasingly important roles in socioeconomic development because of the pandemic (Mathew & Pillai, 2020; Xi et al., 2022). These technologies are changing the way companies create and sustain value for their customers. XR serves as a collective construct covering both VR and AR technologies, which are used interchangeably with mixed reality (Fast-Berglund et al., 2018; Kim & Hall, 2019; Kwok & Koh, 2021). These XR technologies are defined as immersive technologies where people behave as if the technological space is a real space.

Virtual worlds are recognized as an immersive technology because they offer users opportunities to interact with brands (Barnes & Mattsson, 2011; Cho & Menor, 2010). This level of connectivity between users and brands within virtual worlds offers brands greater opportunities to experientially engage their users (Fetscherin et al., 2008). Previous studies have suggested that users can extract real brand experiences from virtual interactions; however, users appear to derive experiences from the escapism and enjoyment retailers can provide in virtual stores (Shin, 2018).

Although users can have various brand experiences in the physical world, web-based XR platforms representing the immersive economy make it possible for users to experience brands in a more diversely (Scholz & Smith, 2016).

The concept of brand experience has attracted substantial interest in XR platforms. XR managers have come to realize that understanding how users experience brands in a virtual store is critical for developing strategies for virtual brand items. In addition, since users in the virtual world represent themselves through avatars, their brand experiences can be further expanded.

Prior studies related to existing brand experiences have focused on the experience economy, with a lack of discussion on the XR-based immersive economy (Brakus et al., 2009; Oh, et al., 2020; Schmitt, 2003). Although some research has been conducted on the brand experience in the virtual world, most have focused on the positive shopping experience or the effect of virtual brand experiences on brand evaluation in the physical world (Barnes & Mattsson, 2015; Pizzi et al., 2020; Shen et al., 2021). Moreover, previously developed scales to measure brand experience have not considered brand experience in XR platforms (Brakus et al., 2009). XR platforms provide new ways to increase engagement, customize content, and appeal to younger generations. They also enable the creation of immersive brand experiences, which can be enhanced through the use of AR and VR technologies. As AR and VR technologies enrich the perception of reality by adding virtual elements, users can experience brands, products, and spaces in new ways that engage all their senses (Jeon, 2023; Shin, 2018). This can enable users to explore, discover, and purchase products in a more intuitive and engaging way, while also enabling brands to provide customized recommendations and personalized offers. Unlike the physical world, XR enables brand experiences that transcend time and space. However, discussions on this issue are lacking.

Thus, this study aims to conceptualize the brand experience users can have through their avatars on web-based XR platforms and develop items to measure it, by providing both a conceptual analysis of brand experience in XR (BXIXR) and a BXIXR scale. The dimensions of BXIXR must be identified to develop a scale that can measure constructs related to each experience dimension. However, compared with other brand constructs, the brand experience dimension is not as associated with immersive economy. Therefore, this research must clearly conceptualize constructs and develop scale items. Adhering to the relevant theory and psychometric principles, the BXIXR scale was developed through a literature review and item generation process, followed by confirmatory factor analysis, reliability analysis, and predictive validity testing (Churchill, 1979; DeVellis, 1991).

The remainder of this study is structured as follows. Section 2 presents a review of the literature in immersive technology, cognitive science, and applied management, and develops a BXIXR scale. Section 3 examines the scale's psychometric properties using standard scale validation procedures. Further, for reliability and validity testing, whether BXIXR affects brand satisfaction directly and indirectly through engagement is examined. Finally, Section 4 discusses the academic and practical implications of this research.

II. Literature Review

A. Extended Reality

XR technologies are among the most prominent new developments in immersive technology (Kim & Hall, 2019), providing an umbrella concept covering all forms of AR and VR, and the concept is often used interchangeably with mixed reality (Fast-Berglund et al., 2018; Kwok & Koh, 2021). Combining the two typologies results in two types of XR applications (AR and VR), this classification emphasizes different functions and sets. First, AR is based on the advent of networks and virtual maps (Wright et al., 2008) and enhances the physical world using location-awareness systems that process information in the real environment (Adner & Kapoor, 2010; Dionisio et al., 2013). AR is present in web-based applications, such as Instagram, and allows users to interact in real time with virtual components in display modes through smart devices. AR is adopted in XR applications to digitally transform objects in real space. Further, AR is not only a component of digitalized identity but also provides endless opportunities for fictional character and personality development.

Second, VR is the most common XR platform. VR increasingly augments users' social lives in physical environments (Hendaoui, 2008; Papagiannidis et al., 2017). Role-playing games, such as Roblox and Fortnite, allow users to interact within imagined 3D spaces. A user's avatar is the main component of VR. Compared to the real world, the social functioning of the individual—in the form of their VR avatars—grows faster, and the learning experience can be significantly accelerated. VR can allow avatars to interact in 3D (Papagiannidis et al., 2013).

AR and VR are considered core concepts in XR technologies. Milgram and Kishino (1994) introduced the reality-virtuality continuum, in which the real and virtual environments are placed on opposite ends with AR located between them. XR applications represent a collaboration between VR and AR and allow users to experience an imagined interaction space (Lee & Yoo, 2021). Prior research describing XR constructs has been considered to adopt a declarative approach because of the human literacy and intelligibility that enable easy content modification and control (Lee & Yoo, 2021). To solve this issue, this study proposes web-based XR application, as the Internet has application-independent attributions.

Using AR and VR technologies within the XR

platform can create a sense of presence and immersion that is difficult to achieve through traditional marketing channels. This can allow users to explore and interact with products and services in a way that feels natural and intuitive. Further, using AR and VR technologies within the XR platform has significant potential for creating immersive brand experiences that can enhance user engagement and build brand loyalty. By providing a multi-sensory experience that allows users to interact with products and services in a realworld context, brands can create a deeper emotional connection with their target audience (Barnes et al., 2015; Kim & Hall, 2018).

B. Brand Experience

Consumers undergo various experiences during information searches related to product purchase, use, and consumption (Lemon & Verhoef, 2016). Schmitt (1999, 2003) considered consumer response to a company's marketing activities as experiential marketing and argued that a successful holistic experience can be provided only when consumers' direct observations and participation precede the experience. According to Schmitt (1999), the holistic experience consists of sensory, affective, perceptive, behavioral, and relational experiences. This experiential marketing is based on the experience economy proposed by Pine and Gilmore (1999) and defined as an economy in which experience is central to economic value.

Brakus et al. (2009) and Zarantonello et al. (2017) conceptualized brand experience from an experience economy perspective and defined it as the subjective and behavioral consumer responses a brand evokes. These researchers argued that brand experiences consist of sensory, emotional, behavioral, and cognitive experiences. First, sensory brand experiences include responses, such as sight, hearing, and touch, induced by the brand. The sensory experience of a brand determines the overall impression of the brand. Stimulating synesthesia, in which two or more senses are harmonized, can lead to successful sensory experiences and build brand equity. Second, emotional

brand experiences can be defined as emotional responses consumers have in response to a brand, that is, the role of emotional experience is to build brand equity by inducing special emotions or feelings related to the brand in consumers. Emotional experiences over a long period of time create emotional bonds between consumers and brands and lead to strong customer loyalty. Third, behavioral brand experiences are the behavioral and physical responses consumers experience through a brand. Companies need to make efforts to enhance experiences related to consumers' lifestyles or interactions with other consumers. Finally, cognitive brand experiences are the cognitive responses consumers have in relation to a brand. Cognitive brand experiences consist of divergent and convergent thinking (Schmitt, 1999), which can promote creative thinking by stimulating consumers' curiosity and various interests. Therefore, if consumers have a successful cognitive brand experience, various associations with the brand are activated, creating a positive effect on the establishment of a consumer-brand relationship.

To successfully provide consumers with a holistic brand experience, product experience, appearance and mood, and communication must be strategically executed (Schmitt, 2003). First, a product experience is a functional, experiential, and aesthetic contact that occurs before and after a purchase. Product experiences convey product value through direct and indirect contact and affect consumer attitudes, purchase intentions, and preferences (Hoch, 2002; Hoch & Ha, 1986). Second, appearance and mood are strategic execution means for delivering brand positioning to target customers. A consistent and differentiated appearance and mood based on a brand concept can convey a strong and favorable brand association to target customers. Finally, communication is a tool that delivers brand value to target customers. Communication should be able to convey not only product information but also emotional pleasure (Schmitt, 2003). When the above three elements are successfully operated and managed, a holistic brand experience is complete.

C. Brand Experiences in XR

Extant studies have focused on brand experiences in the real world and lack discussions on brand experiences in virtual space (Brakus et al., 2009; Pine & Gilmore, 1999; Schmitt, 2003). Some attempts have been made to explain brand experiences for users within the virtual space. When users experience real brands in the virtual world, they can recognize the emotional and practical values as in the physical world (Barnes & Mattsson, 2015). Users who experience enjoyment when a high level of interaction occurs between users and brands in the virtual world develop a high level of flow to the brand and a positive brand attitude (Shen et al., 2021). Pizzi et al. (2020) found that when brand stores in VR are designed to closely resemble the real world, users can have a positive shopping experience, increasing their revisit intention. In particular, this effect was shown to be even greater when users had a high level of knowledge about VR. The above studies are significant in that they explained brand experiences users can have in virtual space platforms. However, these studies only focused on how closely the real world and virtual spaces of a specific brand should match, with a lack of discussion on the types of brand experiences that users could have.

As discussed above, consumers can have various brand experiences in the physical world. Further, for web-based XR platforms, which represent the immersive economy, users could potentially experience brands in a more diverse way (McGill et al., 2002). Brand experience in XR can be defined as the overall behavior and emotional responses that customers have with the brand because of their interactions within the XR environment. The XR platform enables brands to create immersive experiences that transport customers to a different reality, providing a unique and memorable brand experience (Papagiannidis et al., 2013; Shen 2021). Using AR and VR technologies, brands can create interactive product demos, immersive brand storytelling, and personalized experiences that cater to customers' interests and preferences. Further, XR can enable brands to create a more inclusive brand

experience by catering to diverse audiences. The XR environment offers customization options that allow brands to cater to different customer needs and preferences, creating a more personalized experience (Jeon, 2023).

However, this has not been sufficiently explored to date. In addition, because users represent themselves in the virtual world through avatars, their brand experiences could be expanded. Thus, this study aims to conceptualize the brand experiences that users can have through their avatars on a web-based XR platform and develop items to measure it.

III. Development of a Brand Experience in Extended Reality Scale

The initial steps in developing the scale included a literature review and item generation, in line with the relevant theory and psychometric principles. The first step involved specifying the domain of the construct, while the second step was to generate items that capture the specified domain. The text emphasized the importance of selecting an appropriate measurement model and ensuring face or content validity. The ultimate goal was to produce a measure that is both reliable and valid, which requires predictive validity testing (Churchill, 1979; DeVellis, 1991).

To develop BXIXR measurement items, Study 1 derived constructs constituting BXIXR using a netnography study using avatars and conceptualized brand experiences by interacting with the avatars. Study 2 extracted items that can measure the BXIXR constituent constructs derived from Study 1. The validity of each construct was verified through factor analysis. Study 3 verified the influence of BXIXR on engagement to reverify validity of the derived BXIXR (Churchill, 1979; DeVellis, 1991).. Study 4 verified the validity of BXIXR by examining its influence on engagement through brand satisfaction.

A. Study 1: Netnography for Item Generation

1. Research design for netnography

Netnography was conducted for an exploratory study to derive items describing brand experiences that users can have through their avatars in XR. The term "netnography" combines the words "Internet" and "ethnography" and refers to ethnographic studies of online activities (Kozinets, 2015). Netnography allows researchers to gain a deeper understanding of online communities and virtual environments and provides valuable insights into the cultural practices and social dynamics of these virtual spaces (Bowler Jr, 2010). Understanding the unique language and behavior of avatars is necessary to explore avatarbased brand experiences in XR. Therefore, more meaningful data can be expected to be collected if the netnography is performed using avatars in XR from the multi-user mode perspective.

Kozinets (2010) recommends a set of methodological stages and procedures for conducting netnographic studies. Netnography requires researchers to adopt a reflexive and flexible approach to data collection and analysis, adapting their methods to the changing dynamics of online communities.

The study followed the methodological stages and procedures recommended by Kozinets (2012; 2015) for netnographic research. This study aims to investigate how avatars interact with brands in XR environments, focusing on the "entrée" stage of netnographic research. Specifically, the research questions include: (1) How do avatars encounter brands in the XR space? (2) How do avatars interact with brands in the XR space? (3) Does interaction occur among different avatars in the XR brand space? and (4) What are the reactions of avatars who encounter brands in XR?

To address the above research questions, ZEPETO was selected as the representative XR platform for observation in this study owing to its popularity among different generational groups. Launched in 2018 by Snow, a company owned by Naver, ZEPETO has experienced significant growth and had 20,000 cumulative global subscribers as of March 2021 (Lee

et al., 2023). ZEPETO offers unique features, such as avatars with human appearances that can be customized using facial recognition and augmented reality functions, as well as virtual currencies (coins and gems) that can be used to decorate avatars and maps. Overall, ZEPETO's focus on customization, social interaction, and communication activities through avatars has made it a popular XR platform among the MZ generation, contributing to its significant growth since its launch.

The author and two university students majoring in statistical data and business administration, respectively, participated in the netnography study. In addition, to prevent the author's subjectivity from intervening during the netnography process and ensure the data's validity, three field experts also provided feedback. Expert 1 has ten years of experience as an XR developer, Expert 2 has eight years of experience as a researcher in a research institute, and Expert 3 has six years of experience as a marketing manager in a game company. The researchers created individual avatars and participated in the XR platform's brand space. The goal was to observe and analyze how avatars engage with brands and interact with other avatars in the XR environment's brand space. The next stage, data collection, involved the direct observation of the avatars' interactions with brands and with other avatars in the XR space. The researchers collected data through direct observation and recorded the avatars' behaviors, actions, and interactions. The researchers also collected data through direct copying of the avatars' CMCs, such as chats and messages, for two months. The final stage, analysis and interpretation, involved the classification, coding analysis, and contextualization of the collected data. The researchers analyzed the data to identify patterns, themes, and meanings in the avatars' interactions with brands. The author also examined the avatars' reactions to encountering brands in XR and their overall perceptions of the brand space.

2. Deriving brand experiences in XR

The researchers discovered that avatars can assemble

and operate a brand in XR while exploring its features, pursuing enjoyment, and interacting with other avatars in the brand space. Avatars who have diverse brand experiences in XR can increase their engagement if they have a pleasant experience while manipulating brand items (see Appendix Figure A1). The study concluded that the four dimensions of brand experience in XR are search, entertainment, relations, and assembly, which are evoked differently by various brand spaces in XR. Detailed explanations of each concept constituting BXIXR are provided below.

1) Search

Most brand space in XR was designed to allow avatars to search for information about a brand. Search experience in XR can be conceptualized as activities in which avatars find brand functions or benefits in the brand space of XR. Information related to a brand's functions, attributes, and benefits are provided when a user enters the brand space in XR. In addition, avatars can collect related information by accessing products or services. For example, Lexus Megacity provided functions and information about Lexus vehicles, while KT Digicoland provided information about KT's future communication technology.

In the Hyundai M-Line virtual space, avatars can test-drive and drive the vehicles. Although there will be differences from the actual M-Line cars, one can get a brief glimpse of the cars virtually. In particular, minors would be able to know about Hyundai Motor Company M-Line cars after driving a few times, and this may make them think about buying them in the future. (Expert 2)

Since Tonymoly¹⁾ created Brand World in ZEPETO, the number of phone inquiries from actual visitors increased. The contents of cosmetics cannot be checked in ZEPETO; however, one can know that a new product has been launched when the avatars look at the package and container. (Expert 3) The field experts stated that one purpose of creating a brand space in XR is to build brand awareness by conveying brand-related information using high brand accessibility. Although direct experiences cannot be provided, indirect experiences through avatars can sufficiently deliver a range of brand-related information to consumers.

2) Entertainment

Avatars in XR were found to focus more on activities that simply created a good mood rather than purchasing products (services) in the brand space. The entertainment experience in XR can be conceptualized as a play activity enjoyed by avatars in the brand space of XR. As the degree of freedom of avatars increased in the brand space of XR, various entertainment experiences became available.

ZEPETO's Lotte World²) reproduces rides (attractions) from the physical world for avatars to enjoy. In the IONIQ 6³) World, avatars can ride on the IONIQ 6 and practice racing, and in Nike Hangang Park, they can run on the Banpo Bridge. The above activities are simply for pursuing fun and entertainment.

First of all, it has to be fun so that people stay, buy the content, and spend time. Many experts call it engagement. One should stay there without noticing the passing of time. Therefore, a fun space should be created. (Expert 1)

The avatars gathered [in Lotte World] because an environment where people could have fun was created. (Expert 2)

Therefore, through digital ME, or an avatar that represents me, I can do things in the virtual world that I could not do in real life. Hangang Park is especially popular. In the real world, getting into the Han River is illegal. However, it is not illegal in virtual

¹⁾ Tonymoly is a cosmetic brand.

²⁾ Lotte World is the world's largest indoor amusement park.

IONIQ 6 is an electric vehicle produced by Hyundai Motor Company.

space. How often can people living in other regions come to Hangang Park? It is hard. But it is possible here (Expert 3).

As Eisenbeiss et al. (2012) argued, avatars in virtual space can not only lead to immersion in entertainment experiences for new pleasures but also provide an escape from daily life. In the brand space, various experiences are available to pursue fun alone or with other avatars, and through this, a favorable image of a brand can be built.

3) Relations

Avatars accessed through a multi-user mode in XR interact in a space where the social, economic, and physical worlds are combined. An avatar projecting a user's persona interacts with other avatars in the brand space and interchange activities occur. The interchange experience in XR can be conceptualized as activities in which an avatar interacts with other avatars in an XR brand space.

The researchers' avatars met other avatars at CGV⁴), exchanged greetings and introduced themselves, and were able to talk about CGV theaters and seats. Further, in NMIXX⁵) world, they danced together with other avatars to a new song by NMIXX and made photo cards. Although the degree of interaction is weaker than in the physical world, creating interpersonal relationships in XR is possible through connections (followed-following) between avatars.

In Yafit, you can do virtual riding with other people. If I run fast, my avatar goes fast, and if I go slow, other avatars just pass me by. It is possible to compete with Japanese and British people, and even though it is a virtual space, you can interact with each other there. (Expert 1)

Korean songs are popular because of K-pop. When you sing Korean songs in XR karaoke, foreign people [avatars] come in and talk to you. By doing this, you become a singer that you would not become in real life and become an influencer, meeting various people. (Expert 2)

When you sit in a café [in XR], you see one avatar holding a charger and the avatar next to you drinking coffee. Even though it is a virtual space, it is possible to interact within at the same time because it is implemented in 3D. (Expert 3)

The Acceleration Studies Foundation, which introduced the Metaverse concept, also argued that interaction between avatars in virtual space is a key concept necessary to attract users to the Metaverse (Jeon, 2021). Relationships can be formed based on text and images on existing social network services; however, in a brand space in XR, interchanges mediated by text, images, voices, and even actions are possible.

4) Assembly

In XR, companies can provide a brand space for users to freely wear and install their products. Avatars in XR can freely operate, install, and utilize brand products. The assembly experience in XR can be conceptualized as an activity in which an avatar freely operates and installs a product in an XR brand space.

At Gucci World and Bulgari, avatars can freely wear accessories from each brand, and the space of Baskin Robbins Snow Camping was designed to allow avatars to mix and match various ice cream flavors. At Gentle Monster, avatars can also try on various pairs of sunglasses and glasses in the Brand World, which reproduces the store as it is in the real world.

In the virtual world, you can buy a small tote bag that you would have to pay 3 million won for in the real world, or just directly fit it to your avatar without having to buy it. It is not about increasing sales, it is about making this familiarity appeal to the younger

⁴⁾ CGV is a movie theater.

⁵⁾ NMIXX is a female K-pop group.

generation, leading to future purchases. In the end, you need to allow individuals to wear brand items as much as they like. (Expert 2)

If you attach [airplane] equipment, pedals, and a few monitors to make a wide scene, you can create a fighter jet. Operating a plane in reality is difficult, but avatars can directly set the plane, which is only possible in this space. (Expert 3)

From the experience economy perspective, for a brand experience to occur, direct contact must be made between the brand and consumer. However, in the immersive economy, the experience is available through contact between avatars and items, even though the contact occurs in a virtual space. The quality of the interactions between brands and consumers is limited; however, in XR, the barrier between avatars and brands is low, allowing for freer interactions.

B. Study 2: Refinement of Measures

1. Derivation of measurement items

In Study 1, BXIXR was conceptualized through

Table 1	ι.	Scale	dimensionality	and	item	reduction

netnography. In Study 2, vocabulary was selected to describe the components of BXIXR. To identify words and sentences that describe the conceptualized brand experience, the study aimed to select terms that can describe BXIXR based on literature in business administration, computer science, and psychology. The researcher and two research assistants who participated in the netnography study performed the word selection. The researchers reduced the number of selected measurement items through cross-review (see Appendix Figure A2). In total, 23 items were selected through a derivation process (Table 1).

2. Dimensionality of the scale

A survey was conducted with respondents who had experienced one of the brand worlds in the ZEPETO platform within the past month. To gather data, the study selected users of ZEPETO's brand spaces as the sample. A survey was conducted by a research company specializing in panel studies, and survey participants were recruited from the research institute's panels. The study's author screened respondents based on two criteria: age between 20 and 40 and current usage of web-based XR applications. Prior to the survey, after being provided

Dimension	Definition	Item
Search	Activities in which avatars discover the brand's features or benefits in the XR brand space	I can get useful information from OOO. I can identify brand attributes from OOO. I can collect product (service) properties from OOO. I can understand the function of the product (service) from OOO. I was able to figure out the practical performance from OOO.
Entertainment	Entertainment activities avatars can enjoy in the XR brand space	I felt enjoyment in OOO. I had fun at OOO. I felt good at OOO. I was delighted while staying at OOO. While I was at OOO, I felt like I was taking a break.
Relations	Activities where avatars interact with other avatars in the XR brand space	I was able to relate to other avatars in OOO. I was able to interact with other avatars in OOO. Avatars active in OOO affect my avatar activities. I was able to interact with avatars in OOO.
Assembly	Activities in which avatars freely operate and install products in the XR brand space	I was able to use the items in OOO on avatars. I was able to operate OOO products to my will. I was able to freely set the items in OOO. I was able to install items in OOO as I wished.

with an explanation of the study's purpose, panelists were asked to select a brand world they had visited within the last month and told to respond with respect to their experiences with that brand world. A researcher collected data from panelists who agreed to participate in the study for compensation.⁶⁾ The final sample comprised 279 respondents, of which 45.2% were men and 54.8% were women. The participants' age range was 20-40 years. The researcher explained the purpose of the survey to the panelists and informed them that they could withdraw at any time; all data would be kept confidential according to the Korean Statistical Law; all personal data would be destroyed after 1 year.

The researcher reduced the number of scale items and conducted both exploratory and confirmatory analyses. Exploratory factor analysis revealed four factors with eigenvalues greater than 1, which explained 71.803% of the variance. After varimax rotation, a factor structure emerged. As Table 2 shows, the entertainment items loaded on the first factor, the search items loaded on the second factor, the relations items loaded on the third factor, and the assembly items loaded on the fourth factor. Cronbach's alpha should be greater than 0.7 (entertainment should be greater than .909, search should be greater than .857, relations should be greater than .905, and assembly should be greater than .849). After removing one item (Et5), which lacked explanatory power, a confirmatory factor analysis was conducted to test the validity of each construct and measurement item. The results showed convergent validity and discriminant validity (Table 3). All the model fit indicators were acceptable; thus, model fit was also found to be significant, based on the following values: root mean square error of approximation (RMSEA) = .067, normed fit index (NFI) = .921, comparative fit index (CFI) = .954, Tucker-Lewis index (TLI) = .945, and incremental

Table	2.	Exploratory	factor	analysis:	BXIXR	dimensions
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Scale	Entertainment	Search	Relations	Assembly	Cumulative %
Et1: I felt enjoyment in OOO.	.859	.240	.122	.161	
Et2: I had fun at OOO	.841	.245	.167	.126	
Et3: I felt good at OOO.	.839	.204	.196	.124	45.363
Et4: I was delighted while staying at OOO.	.787	.282	.208	.164	
Et5: While I was at OOO, I felt like I was taking a break.	.560	.224	.317	.300	
Se1: I could obtain useful information from OOO.	.170	.788	.217	.141	
Se2: I could identify brand attributes from OOO.	.222	.782	.159	.155	
Se3: I could collect product (service) properties from OOO.	.219	.733	.158	.146	56 530
Se4: I could understand the function of products (services) from OOO.	.165	.726	.181	.161	50.550
Se5: I was able to determine practical performance from OOO.	.374	.636	.020	.167	
Rel: I was able to relate to other avatars in OOO.	.165	.168	.845	.254	
Re2: I was able to interact with other avatars in OOO.	.196	.197	.825	.230	64 61 4
Re3: Avatars active in OOO affected my avatar's activities.	.218	.108	.797	.242	04.014
Re4: I was able to interact with avatars in OOO.	.170	.223	.785	.163	
As1: I was able to use the items in OOO on avatars.	.149	.205	.177	.844	
As2: I was able to operate OOO products as I wanted.	.082	.130	.181	.837	71 002
As3: I was able to freely set the items in OOO.	.201	.244	.252	.698	/1.803
As4: I was able to install items in OOO as I wished.	.232	.122	.271	.659	

6) One mileage point in a research institute.

fit index (IFI) = .955, with x2 = 253.644, p < 0.001, and degrees of freedom = 113. In addition, analyzing the correlations between each factor showed that each concept had a significant correlation (Table 4).

C. Study 3: Additional Validity Tests and Predicting Engagement

Study 3 focused on engagement. The immersive technology perspective suggests that the realization of XR depends on whether users are immersed in a virtual space. In virtual spaces, XR engagement is associated with individual experiences during exploration. Engaged users are relevant to platform performance, as they decide to grant higher levels of attention and intention to interact with a platform (Lourenço et al., 2022). If users show high degrees of immersion when interacting with an XR platform, they forget the real world for a while, and their participation and activity levels in the virtual space increase. In particular, when new experiences that are difficult to encounter in the real world are provided, user engagement increases (Huang et al., 2021). Therefore, an XR platform providing innovation based on user experiences will lead to successful engagement (Jeon, 2021).

Thus, if BXIXR is successfully delivered, users can be expected to become more immersed in the brand space. Brand experience studies based on the

Table 3. Confirmatory factor analysis: Four-factor model

Dimension	Item	Estimate	Standardized Estimate	S.E.	C.R.	Р
	Se1	1.108	.784	.093	11.977	.000
	Se3	1.047	.744	.092	11.414	.000
Search	Se2	.994	.795	.082	12.128	.000
	Se5	.852	.670	.082	10.340	.000
	Se4	1.000	.712			
Entertainment	Et4	.890	.838	.048	18.545	.000
	Et3	.904	.854	.047	19.220	.000
	Et1	1.008	.898	.048	21.157	.000
	Et2	1.000	.881			
	Re2	1.023	.868	.059	17.315	.000
Delations	Re4	1.000	.775	.068	14.719	.000
Relations	Re1	1.120	.900	.062	18.198	.000
	Re3	1.000	.823			
	As2	1.214	.803	.107	11.333	.000
Assembly	As1	1.309	.874	.110	11.955	.000
Assembly	As3	1.024	.733	.097	10.551	.000
	As4	1.000	.664			

Table 4. Correlations

	Search	Entertainment	Relations	Assembly
Search	1			
Entertainment	.574**	1		
Relations	.464**	.467**	1	
Assembly	.486**	.441**	.558**	1

** p < .001

experience economy have shown that, if consumers are provided with a holistic brand experience, their relationship with the brand strengthens, and their degree of immersion increases (Hoch, 2002; Pine & Gilmore, 1999).

Based on existing studies, Study 3 aimed to test whether BXIXR can increase user engagement in the brand experience space. This would help demonstrate whether the scale has external validity and can be generalized beyond the specific sample. The author can then assess whether the scale can accurately predict engagement. Accordingly, the following hypothesis is proposed:

Hypothesis 1. BXIXR will have a positive effect on user engagement.

1. Procedure and results

Similar to Study 2, a survey was conducted with respondents who had experienced one of the brand worlds in the ZEPETO platform within the past month. Survey participants were recruited from the research institute's panels. The author collected data from

Table 5. Exploratory factor analysis: Varimax rotation

panelists who agreed to participate in the study in exchange for compensation. The BXIXR scale included the 17 items used in Study 2. Engagement was defined as the quality of user immersion within an XR application. This study adapted the items from Study 2—developed by Huang et al. (2021) and Lourenço et al. (2022) (i.e., I see myself as a part of this brand space; I am very attached to this brand space; I feel I will fit into this brand space; I did not notice the time passing while I was in brand space.). The sample comprised 227 respondents, of which 47.1% were men and 52.9% were women. Participants' age range was 20-40 years.

Both exploratory and confirmatory analyses were conducted. The exploratory factor analysis showed that the four factors found in Studies 1 and 2 were successfully extracted. The four factors had eigenvalues greater than 1 and explained 73.412% of the variance (Table 5). After varimax rotation, a clean factor structure emerged. Cronbach's alpha should be greater than 0.7 in reliability testing (entertainment should be greater than .928, search should be greater than .858,

Item	Search	Entertainment	Relations	Assembly	Cumulative %	
Se2	.799	.173	.138	.173		
Sel	.778	.182	.207	.125		
Se4	.728	.151	.208	.123	19.361	
Se3	.710	.249	.147	.181		
Se5	.685	.299	.020	.191		
Et1	.262	.857	.141	.181		
Et2	.236	.852	.180	.173	29.247	
Et3	.235	.834	.239	.137	38.347	
Et4	.307	.762	.256	.180		
Re1	.180	.165	.836	.276		
Re2	.197	.189	.828	.254	56,600	
Re4	.200	.171	.789	.167	56.690	
Re3	.104	.239	.772	.273		
Asl	.205	.148	.205	.838		
As2	.105	.105	.214	.823	72,412	
As3	.247	.189	.243	.718	/3.412	
As4	.184	.190	.259	.679		

relations should be greater than .903, and assembly should be greater than .856). Table 6 presents the results of the confirmatory factor analysis. All the model fit indicators were acceptable; thus, model fit was found to be significant, based on the following values: RMSEA = .061, NFI = .922, CFI = .962, TLI = .955, and IFI = .963 with x2 = 208.587, p < 0.001, and degrees of freedom = 113.

Regression analysis was conducted to test Hypothesis 1 proposed in Study 3 (Table 7). The results showed that search experience did not have a significant effect on engagement (b = -.076, p =0.0941). However, entertainment experience (b = .490, p < 0.01), relations experience (b = .270, p < 0.01), and assembly experience (b = .223, p < 0.01) were found to have significant effects on engagement. Thus, the results indicated that search experience did not affect engagement; however, entertainment, relations, and assembly experience increased engagement. This suggests that users who have various experiences in a brand space can increase their immersion in XR if they have a pleasant experience while interacting with various avatars and freely manipulating brand items. However, the information search experience related to a brand in an XR space will not provide users with a high level of immersion.

Table	6.	Confirmatory	factor	analysis
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Dimension	Item	Estimate	Standardized Estimate	S.E.	C.R.	Р
	Se2	1.002	.793	.093	10.742	.000
	Se5	.894	.689	.095	9.460	.000
Search	Se4	1.000	.703			
	Se3	1.085	.750	.106	10.233	.000
	Se1	1.114	.776	.106	10.546	.000
Entertainment	Et3	.911	.871	.050	18.385	.000
	Et1	1.000	.899	.051	19.618	.000
	Et2	1.000	.887			
	Et4	.907	.838	.053	17.060	.000
	Re4	1.022	.767	.079	12.911	.000
Dalations	Re1	1.131	.900	.070	16.092	.000
Relations	Re3	1.000	.813			
	Re2	1.059	.881	.068	15.653	.000
	As1	1.221	.868	.107	11.442	.000
Aggembly	As3	.980	.756	.096	10.248	.000
Assembly	As4	1.000	.694			
	As2	1.134	.792	.106	10.680	.000

Table 7. Structular equation modeling result	Table 7	Structural equation	modeling	results
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	Estimate	Standardized Estimate	S.E.	C.R.	Р
Search	099	076	.059	-1.677	.094
Entertainment	.505	.490	.062	8.144	.000
Relations	.276	.270	.068	4.081	.000
Assembly	.302	.223	.090	3.357	.000

Dependent variable: engagement; RMSEA = .084, NFI = .877, CFI = .920, TLI = .907, and IFI = .920, with $x^2 = 475.386$, p < 0.001, and degrees of freedom = 182

D. Study 4: Predicting Engagement and Satisfaction

In Study 4, the direct effects of BXIXR on brand satisfaction were first explored, followed by the indirect effects mediated by engagement. XR experiences provide value and utility (Tom Dieck & Han, 2022). Experience provides various types of value; thus, the more a brand evokes multiple experience dimensions in XR, and therefore, has a higher overall score on the scale, the more satisfied a user is expected to be with a brand (McLean & Wilson, 2019). Moreover, because experiences result from virtual stimulation and lead to pleasurable responses, users are expected to want to repeat those experiences (Alnagrat et al., 2021; Mollen & Wilson, 2010). Thus, BXIXR should affect not only past-directed engagement judgments but also future-directed satisfaction. This demonstrates that the BXIXR scale can be generalized beyond the specific context in which it was initially developed. Additionally, testing predictive validity is essential to determine the practical value of the BXIXR scale, as it can provide evidence of its usefulness in predicting relevant outcomes in different domains. The following hypotheses are proposed:

- **Hypothesis 2.** BXIXR will have a positive effect on satisfaction.
- **Hypothesis 3.** Engagement will have a positive effect on satisfaction.

1. Procedure and results

Similar to Study 3, this study conducted a survey by recruiting participants from the research institute's panels and screened them based on the following two criteria: 1) they had to be between 20 and 40 years of age, because currently, most XR platform users are between their 20s and 40s, and 2) they had experienced one of the brand worlds in the ZEPETO platform within the past month. The author collected data from panelists who agreed to participate in the study and received compensation in exchange for their time.

The BXIXR and Engagement scale included the

21 items used in Study 3. Brand satisfaction in XR was measured using four items modeled after Oliver (1980) (i.e., I am satisfied with this brand; I am happy with what I did with this brand; My choice to get this brand has been a wise one; I feel good about my decision to get this brand.). The sample comprised 309 respondents, of which 48.9% were men and 51.1% were women. Participants' age range was 20-40 years.

Cronbach's alpha should be greater than .7 in reliability testing (entertainment should be greater than .930, search should be greater than .853, relations should be greater than .910, assembly should be greater than .939, and satisfaction should be greater than .926). Table 8 presents the confirmatory factor analysis results. All the model fit indicators were acceptable, and model fit was found to be significant based on the following values: RMSEA = .067, NFI = .910, CFI = .946, TLI = .937, and IFI = .946, with x2 = 614.151, p < 0.001, and degrees of freedom = 260.

Figure 1 shows the results of the hypothesis tests. The solid lines indicate a significant relationship, whereas the dotted lines indicate non-significant relationships. The results revealed that entertainment (b = .532, p < .01), relations (b = .260, p < .01), and assembly (b = .210, p < .01) had a significant positive effect on engagement; however, search had a non-significant positive effect on engagement.

The results further showed that search (b = .172, p < .01) and entertainment (b = .435, p < .01) had a significant positive effect on satisfaction, whereas the effects of relations and assembly were not significant. Finally, engagement had a significant effect on satisfaction (b = .467, p < .01). These results indicated that the direct effect of search on satisfaction is significant (Table 9). Thus, the experience of searching the brand space in XR appears to be a stronger predictor of satisfaction than the other features. In addition, these results showed significant indirect effects of entertainment, relations, and assembly on satisfaction, indicating that engagement acts as a partial mediator of brand satisfaction in XR.

Dimension	Item	Estimate	Standardized Estimate	S.E.	C.R.	Р
	Sel	1.000	776			
	Se3	.937	.754	.070	13.290	.000
Search	Se2	.884	.784	.064	13.865	.000
	Se5	.733	.653	.065	11.325	.000
	Se4	.903	.712	.072	12.481	.000
	Et2	1.000	.882			
	Et1	.999	.897	.044	22.831	.000
Entertainment	Et3	.920	.864	.044	21.111	.000
	Et4	.920	.864	.044	21.119	.000
Relations	Re3	1.000	.826			
	Rel	1.092	.888	.057	19.066	.000
	Re4	1.027	.800	.063	16.339	.000
	Re2	1.043	.881	.055	18.860	.000
	As4	1.000	.659			
	As3	1.017	.726	.093	10.978	.000
Assembly	As1	1.306	.874	.104	12.547	.000
	As2	1.240	.811	.104	11.975	.000
	Eg1	1.000	.825			
	Eg2	1.215	.895	.061	20.082	.000
Engagement	Eg3	1.186	.923	.056	21.164	.000
	Eg4	1.202	.928	.056	21.350	.000
	St1	1.000	.856			
	St2	.940	.849	.048	19.489	.000
Satisfaction	St3	.994	.896	.046	21.561	.000
	St4	.971	.889	.046	21.246	.000

Table 8. Confirmatory factor analysis with engagement and satisfaction



Figure 1. Path analysis

		Search	Entertainment	Relations	Assembly	Engagement	Satisfaction
Standardized Total Effects	Engagement	083	.532	.260	.210	.000	.000
	Satisfaction	.133	.683	.027	.168	.467	.000
Standardized Direct Effects	Engagement	083	.532	.260	.210	.000	.000
	Satisfaction	.172	.435	095	.069	.467	.000
Standardized Indirect Effects	Engagement	.000	.000	.000	.000	.000	.000
	Satisfaction	039	.248	.121	.098	.000	.000

Table 9. Total effects with engagement and satisfaction

IV. Conclusion

The concept of the XR platform holds significant implications for the future of marketing, including the ability to increase engagement through new and innovative means, customization and diversity in building brand experiences, targeting younger generations, and introducing new layers to social commerce. If the concept of the XR platform becomes mainstream, brands will need to adapt their creative communication strategies to incorporate advanced virtual capabilities for customer experiences. As the influence of XR platforms continues to grow, brands must step up to ensure they provide winning customer experiences. To prepare for XR platforms, brands should begin by exploring AR and VR elements and planning to expand their virtual presence into an immersive landscape where personalization and inclusion are of utmost importance.

Prior relevant studies have only focused on the technical functions of XR, with little research related to the brand experience users can have in XR. Unlike the physical world, XR enables a brand experience that transcends time and space. Further, previous brand experience research has focused on the experience economy; however, research on the immersive economy based on XR is lacking. Specifically, few studies have examined the brand experience that users can experience in XR, which represents an untested Metaverse platform in the field of humanities and social sciences.

This research suggested that the brand experience that users have at the boundary between the physical and virtual worlds may differ from brand experience in the physical world. Customers increasingly seek interaction with products and services. Prior to making a purchase, consumers desire to learn about, feel, and experience products. The XR platform presents a novel opportunity for consumers to explore and test products before making a purchase, in a way that has never before been possible. As discussed above, prior research was verified based on the experience economy. However, in this study, it is expected that meaningful implications can be proposed in that it attempts to derive a brand experience based on an immersive economy.

The purpose of this study was to conceptualize brand experiences that users can have in the virtual space companies provide on XR platforms and develop scales to measure it. Brakus et al. (2009) proposed a framework for understanding brand experience from the perspective of the experience economy. They defined brand experience as the subjective and behavioral responses evoked by a brand, and identified sensory (This brand makes a strong impression on my visual sense or other senses; I find this brand interesting in a sensory way; This brand does not appeal to my senses), affective (This brand induces feelings and sentiments; I do not have strong emotions for this brand; This brand is an emotional brand), behavioral (I engage in physical actions and behaviors when I use this brand; This brand results in bodily experiences; This brand is not action oriented), and intellectual experiences (I engage in a lot of thinking when I encounter this brand; This brand does not make me think; This brand stimulates my curiosity and problem solving) as its key dimensions. Most prior studies on brand experience have focused on experiences in the physical world. However, as VR becomes increasingly prevalent, brands should consider incorporating AR and VR elements into their marketing strategies and expanding their virtual presence to offer personalized and inclusive experiences in immersive virtual environments. XR experiences occur in various settings when users search for, use, and consume brands. This research offers important findings. First, BXIXR was conceptualized as subjective user responses evoked by brand spaces related to experiential attributes in XR platforms. This research demonstrated that BXIXR can be broken down into four dimensions (i.e., search, entertainment, relations, and assembly), which are evoked in different ways within various brand spaces in XR. Thus, users can freely assemble and operate a brand while exploring the brand's features, pursuing fun, and interacting with other avatars in the brand space in XR. Second, the results showed that users who have various brand experiences in XR can increase their engagement if they have a pleasant experience while manipulating brand items. However, search experiences related to brands in XR do not appear to provide users with a high level of immersion.

The BXIXR scale constructed in this research is easy to administer and comprises 17 items. This scale showed internal consistency and was found to be consistent across four studies. The scale also demonstrated reliability and validity. Finally, BXIXR has user responses and affects brand satisfaction directly and indirectly through engagement. The results of this study suggest that the BXIXR scale is a reliable and valid measure of BXIXR. The scale was developed through a rigorous process that adhered to the relevant theory and psychometric principles. The four-factor structure of the scale is consistent with the theoretical framework, and the results of the reliability and validity testing provide evidence for its robustness.

Omnichannel customer engagement is a key driver of loyalty, and the inclusion of the metaverse as another channel can only improve the overall experience. With the untapped potential of the metaverse and the multitude of platforms that have embraced its concept, brands and creators alike have the opportunity to innovate with experiences and content that were previously out of reach. The metaverse can be leveraged to a brand's advantage, regardless of its specific business goals.

A. Future Research

The scale developed in this research has both academic and practical uses. As brand managers engage in XR platforms to understand the experience their brands provide for their users, they can use the scale for planning and tracking purposes.

This research also had a few limitations. First, it assessed experiences retrospectively, and dynamic user experiences with a brand space in a virtual world were not directly examined. For example, many experiences in the virtual world extend over time. This research used the term "experience" to refer to responses within a virtual world. Further research should investigate whether retrospective experiences are different from various experiences in the virtual world. Second, further research should focus on the antecedents and consequences of BXIXR. Although this research demonstrated both the direct and indirect effects of BXIXR on short-term outcomes, such as engagement and satisfaction, questions arise regarding whether BXIXR affects user behavior on XR platforms. Specifically, can BXIXR build brand equity, and how should XR managers manage brands to create experiences that build such equity? Finally, this research did not consider the type of XR. Prior studies have categorized XR platform into two types: AR and VR. This research provides important implications for BXIXR including AR and VR, offering prescriptive suggestions. It also offers insights for understanding how BXIXR affects engagement. Therefore, to explain BXIXR's effects on satisfaction thoroughly, future studies should consider XR types and other potential determinants. Further research is needed to evaluate the generalizability of the scale to different populations and contexts.

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The authors report there are no competing interests to declare.

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Search	Be			
	Nike Store	LEXUS Mega City		
	• •			
	KT DIGICO	CGV		
Entertainment				
	LotteWorld	LotteWorld Adventure		
		JEJU SAMDASOO		
	IONIQ 6	Samdasoo		
Relations		<u></u>		
	NXXIX	CGV		
	C.			
	CGV	Baskin Robbinson		
Assembly				
	Gucci World	CU convenience store		
	BCLGARI	Alice in Wonderland		

Appendix Figure A1. Netnography cases

Search	Entertainment			
test-drive and drive the vehicles look at the package and container get a brief gimpse find out the date of the movie's showing brand-related information function attribute practical performance Search Experience Search Experience Search Experience	Spend a time without noticing the passing of time pleasures but also provide an escape from daily life ride the rides delight play activity enjoyment fun Entertainment Experience Entertainment Experience fun			
Relations	Assembly			
riding with other people talk to you become an influencer, meeting various people interact within at the same time	If it it to your avatar without having to buy it wear brand items create a fighter jet freely wear and install their products			
interacts exchanged greetings interpersonal introduce introduce	use operate install set			
Relations Experience	Assembly Experience			

Appendix Figure A2. Diagrams of selecting items