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Is Virtual Reality for Retail Marketing Research? Research Opportunities and Methods

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ABSTRACT

Despite popularities of virtual reality (VR), there has been limited studies adopting VR to investigate consumer behaviors in retail marketing settings. Thus, the objective of this paper is to propose two key areas of opportunities for VR research in the retail marketing discipline: 1) research with VR as a tool to examine consumer behaviors in VR replicas of physical stores and 2) research for VR as a new retail marketing context to investigate virtual consumption behaviors within entirely virtual worlds. Further, this study proposes using advanced VR-comparable or VR-based behavioral tracking technologies to measure consumer behavior and experience by capturing immediate, unintentional, and natural human responses, such as eye movements, facial expressions, and head motions. These direct measures can provide deep insights into consumer emotions, attention, and reactions, potentially uncovering the nature and process of consumer behavior and experience that have not been discovered by self-report methods alone.

Keywords: Virtual reality, VR, Retail, Consumer behavior, Metaverse, Virtual consumption

INTRODUCTION

Virtual reality (VR) creates virtual environments where users can experience 3D spaces, making them feel as though they are physically present in a computer-generated space (Shen *et al.*, 2021; Taufik, Kunz and Onwezen, 2021). Initially, VR applications were highly specialized and limited to professional settings due to the high costs associated with their development and use. For example, NASA utilized VR technology for training astronauts (NASA Spinoff, 2005). However, as of 2024, VR technology and its associated equipment have become more affordable and accessible, leading to rapid adoption and growing popularity among general consumers, particularly with the advent of head-mounted displays (HMDs; Lanier *et al.*, 2019). The future integration of AI-driven 3D image generators in VR is expected to further enhance user adoption by enabling the quick and easy customization of immersive environments to meet individual needs (Program-Ace, 2023). This technological advancement promises to broaden the appeal and functionality of VR across various domains.

In recent years, VR has been extensively researched by scholars in fields such as engineering, architecture, and education. Despite this, a significant gap remains in the literature concerning the application of VR technology in retail and consumer behavior research, with only a few exceptions of studies focusing on areas like food consumption (Shen *et al.*, 2021; Taufik, Kunz and Onwezen, 2021). Given VR's ability to replicate real physical spaces and create a sense of presence for users, such as simulating a physical retail store, VR stands as a potentially powerful tool for researching retail environments and atmospheres. It can overcome the limitations of other research methods (e.g., scenario-based experiments) by enhancing the realism and accuracy of studies in a cost-effective manner. Moreover, the virtual space, including VR social platforms like VRChat, Altspace VR, RecRoom, Roblox, and Second Life, presents a vast potential market for retailers, offering fertile ground for future research. Investigating consumer behaviors in these virtual spaces could provide valuable insights for both academic research and practical applications in retail.

This paper aims to offer valuable research directions and suggestions to scholars interested in this field by proposing potential research opportunities and methodologies for retail marketing research that leverage VR technology. In the following sections, we first explore opportunities in two distinct areas of retail research involving VR: 1) *Research with VR* as a tool and 2) *Research for VR* as a new context of retail marketing. Then, we discuss diverse data elicitation methods for researchers to apply in their VR-based investigations.

VR-BASED RETAIL MARKETING RESEARCH OPPORTUNITIES

Research "With" VR: VR as a Tool

Research with VR refers to research in which researchers use VR-based virtual environments as a tool to approximate physical retail environments to examine consumer behavior. VR can effectively replicate real-life settings, leading to consumer behaviors in virtual retail environments that are similar to those in physical stores (Cheah *et al.*, 2019; Siegrist *et al.*, 2019; Ung *et al.*, 2018). This is supported by studies indicating that consumers' product purchase decisions, such as choosing cereals, do not differ between a physical retail shelf and its VR counterpart (Siegrist *et al.*, 2019). VR technology creates an immersive experience that closely mirrors the real world through 3D space, engaging users' visual, auditory, haptic, and motion senses, and providing them with spatial and copresence perceptions (Shen *et al.*, 2021). Consequently, VR offers significant advantages for researching consumer behaviors in relation to retail atmospheres and environmental cues, such as ambient factors (e.g., music, noise, and air), design factors (e.g., architecture, color, layout, and signage), and social factors (e.g., appearance, behavior, and the number of other consumers or salespeople; Baker, 1987).

Historically, researchers investigating store atmospheres often visited physical malls to collect data from shoppers, measuring their experiences and emotional reactions in retail environments (e.g., Donovan *et al.*, 1994). However, this traditional method has many limitations as it is time-consuming, is costly, and lacks the ability to manipulate and control specific

elements within the retail atmosphere. Particularly, the last limitation has posed a tremendous obstacle in causal research as it is extremely challenging to pinpoint the factors among the numerous co-present environmental factors in a real-life store impacting consumer behavior and attitudes. Another historically common method in retail research involves using image stimuli (e.g., storefront display images) accompanied by scenarios to study effects of store atmospherics (Cornelius, Natter and Faure, 2010). This method enables researchers to have higher control over the manipulation of causal factors and control of potential confounding factors; however, it lacks the ability to capture real-time behavioral data and is often limited to the examination of participants' self-report data. Further, participants in visual and verbal scenario-based research are unlikely to experience the same level of immersion as they would in a real store, potentially failing to capture genuine consumer behaviors and reactions, thus reducing the accuracy and relevance of the findings.

VR technology addresses these challenges by allowing researchers to precisely control and manipulate various aspects of the retail environment in a cost-effective manner (Taufik, Kunz and Onwezen, 2021). This capability enables more accurate and comprehensive studies of how different atmospheric elements influence consumer behavior. The immersive experience provided by VR allows researchers to study these behaviors without the need to physically alter retail environments. For example, researchers can develop 3D store environments for VR and manipulate diverse factors related to store atmosphere, such as music, noise, wall color, and product presentations. The development of store environments can be easily achieved through various 3D design software, like Google SketchUp and MockShop, without requiring expertise in VR-specific software (e.g., Unity). Additionally, 3D cameras can capture real physical stores as 3D images, which can then be used to create and implement digital environments in VR (Drofova *et al.*, 2021). This approach allows researchers to easily manipulate ambient and design factors in store atmospheres to investigate their effects on consumer behavior in a replica of physical space via immersive and realistic VR store environments, providing a richer and more in-depth understanding of consumer behaviors at a relatively low cost (Taufik, Kunz and Onwezen, 2021).

Beyond effectively manipulating ambient and design factors, researchers can also examine social factors in VR retail environments. For instance, verbal and non-verbal communications among consumers, as well as interactions between consumers and salespeople, can be observed in virtual retail stores. Such social interactions through VR are frequently examined in fields like engineering (e.g., Andrei *et al.*, 2023), architecture (e.g., Du *et al.*, 2018), and education (e.g., Blome *et al.*, 2017), yet there has been little research on how consumers interact with others in a retail setting. Research considering these social interactions can be achieved in metaverse environments, where users exist and interact with one another through digital avatars (Meetaverse, 2023).

Research "for" VR: VR as a New Retail Marketing Context

Research for VR addresses research on consumer behaviors in the context of virtual consumption. Virtual social spaces, such as Meta, Roblox, The Sandbox, and Rec Room, are 3D virtual worlds where users interact with others through avatars and experience life much like in the physical world (Joy *et al.*, 2022). In these immersive environments, just like a real life, people engage in consumption behaviors related to products and services, such as purchasing virtual clothing for avatars, virtual real estates, or virtual gaming items (Jin and Bolebruch, 2010; Shen *et al.*, 2021). For instance, the Meta avatar store, launched in 2022, offers luxury fashion brands such as Balenciaga, Thom Browne, and Prada. This allows users to purchase digital clothing to customize their avatars in Meta's metaverse platform and wear those digital items on their real pictures to use them for social media platforms like Instagram and Facebook (Hirschmiller, 2022). These purchasing activities in the 3D virtual world are defined as 'virtual consumption,' where users buy virtual products and services using virtual or real-world currencies (Denegri-Knott and Molesworth, 2010). Further, a significant development in virtual products is the rise of non-fungible tokens (NFTs), which have garnered substantial scholarly attention. NFTs are digital products tokenized on a blockchain, making them transferable across different platforms and tradable for real-life currency. An example is Burberry's in-game character NFT, Blankos Block Party, which can be used in the game and bought and sold among players for real-world currency (Burberry, 2022).

Retailers aim to increase sales of digital products in virtual worlds, much like their goals in physical retail environments. Thus, investigating how various factors in virtual store environments influence consumer preferences and behaviors is essential. Researchers can explore how to design storefront displays, store layouts, and digital product presentations to enhance the shopping experience in virtual stores. Additionally, the impact of ambient factors, such as background music in virtual stores, on consumer preferences can be studied. There is a lack of existing literature focusing on how store atmosphere factors influence consumption behavior in immersive environments, with most research primarily investigating the effectiveness of visual elements (Shen *et al.*, 2021). Considering social factors, researchers can examine the verbal and non-verbal behavior of virtual salespeople (digital avatars with artificial intelligence that serves customers in virtual stores) and its impact on consumer experiences and behaviors (Jin and Bolebruch, 2010). The interactions between consumers in virtual stores and their subsequent influence on virtual consumption behaviors can also be investigated. Also, researchers can compare these consumer behaviors with those in physical retail environments, which can reveal whether consumer behaviors via digital avatars in virtual worlds are comparable to their real-life behaviors.

Further, the development of virtual products in virtual worlds presents another research area. Customization and personalization are more accessible for virtual products than physical ones, providing consumers opportunities to design their digital products. For example, luxury brand

Salvatore Ferragamo offered customized NFT shoes to consumers who purchased their clothing (Mcdowell, 2022). Investigating the impact of co-creating virtual products with consumers on purchasing behavior can be insightful. Additionally, as consumers' consumption behaviors can blur the boundaries between physical and virtual consumptions, researchers can investigate whether consumers' perceptions and preferences for new products and designs in the virtual world—where designers can exhibit creativity without physical constraints—carry over to physical products. This could provide valuable insights for retailers looking to test new products and designs in the virtual universe before physical production (Petkov, 2023).

Lastly, researchers can explore how retailers' activities in virtual environments influence consumer brand perceptions. Retailers use virtual immersive environments to promote their brands and build positive brand images among younger generations as a marketing and promotion tool, and the impact of marketing and advertising in these spaces is substantial and growing. For example, over 108,000 people logged into the metaverse during the 2022 Metaverse Fashion Week, featuring brands like Etro, Dolce & Gabbana, and Tommy Hilfiger (Moss, 2023). Researchers can examine how consumer interactions with brands in virtual environments affect brand perceptions, including brand recognition, brand attitudes, and brand loyalty, ultimately impacting brand equity.

METHODS FOR RESEARCHING CONSUMER BEHAVIOR AND EXPERIENCE IN VR ENVIRONMENTS

Although emerging studies have begun to investigate consumer behaviors in retail environments utilizing VR, most previous literature has been limited to measuring these behaviors through self-reported perceptions after the VR experiences (Animesh *et al.*, 2011; Shen *et al.*, 2021). These studies often employed psychometric measures to capture outcomes of the VR experiences, such as purchase intentions (Animesh *et al.*, 2011), attitudes towards products and brands (Jin and Bolebruch, 2010), and hedonic and utilitarian value perceptions (Shen *et al.*, 2021). They also used psychometric scales to examine immersive experience, such as spatial presence, social presence, and experienced realism (Shen *et al.*, 2021).

In contrast to these self-report approaches, we suggest a more direct and accurate method for examining consumers' behaviors and experiences in virtual immersive retail environments. Human reactions to stimuli, particularly in VR, can be reflected through various physical reactions, including eye behavior, head motion, facial expressions, gestures, and posture (Antonijević, 2013; Birmingham, 2021). To directly measure these physical reactions, movements of the face and head can be tracked using HMDs equipped with advanced head-, face-, and eye-tracking technologies (Birmingham, 2021). While these technologies are often used to replicate users' expressions through their avatars to enhance immersive experiences, we propose utilizing them to capture consumers' reactions directly in 3D virtual immersive environments. For example, researchers can record consumers' eye movements and blinking to determine where their attention

is focused while shopping in the virtual environment. This analysis can be conducted using eye-tracking and HMD gaze-point data such as those collected through Pupil Capture through the Eyes-HMD package (Andrei *et al.*, 2023). Eye blinking can be also measured via electromyography (EMG) readings, which capture the electrical activity of orbicularis oculi muscles around the upper and lower eyelids by attaching small electrodes to these muscles (Dharmawansa, 2015; Dharmawansa *et al.*, 2015). Real-time video via a web camera can detect eye gaze, facial expressions, and head movements both directly from VR users and indirectly from virtual avatars (Dharmawansa, Nakahira and Fukumura 2013; Dharmawansa, 2015). Recorded video can be analyzed using Haar-feature cascade-classification to detect facial features, such as eyes, nose, and mouth, and determine facial expressions and head movements (Dharmawansa, 2015; Dharmawansa *et al.*, 2015).

Researchers can analyze consumers' emotional responses, status, and behavioral intentions by triangulating the data of eye gaze and movements, facial expressions, and head movements captured by the tracking technologies. For instance, eye blinking, gaze, and head movements can be used to assess consumers' attention, frustration, distraction, tiredness, and cognitive load (Dharmawansa, 2015). Observing gestures in VR can evaluate positive and negative responses during interactions, such as nodding in agreement, eye contact, facial expressions of enjoyment, or negative behaviors like talking to others in the audience and looking away (Girondini *et al.*, 2024). Additionally, researchers can observe users' emotions and behaviors indirectly through digital avatars' facial expressions and actions, particularly for research in virtual consumption in 3D immersive platforms like VRChat, Altspace VR, RecRoom, Roblox, and Second Life. For example, avatars' gaze direction and hand gestures can infer consumers' attention to certain virtual products, while dancing and playing with objects can indicate consumers' emotions such as enjoyment and entertainment (Maloney, Freeman, and Wohn, 2020). Positive social interactions in virtual retail environments can be observed through behaviors like nodding, applause, and social grooming (e.g., waving, dancing, and kissing) (Maloney, Freeman and Wohn, 2020). Universal facial expressions (i.e., surprise, anger, fear, happiness, disgust, and sadness) can be captured from digital avatars' facial feature movements in the upper (eyebrows and forehead), mid (eyes and nose), and lower faces (mouth, cheeks, and chin) (Fabri, Moore and Hobbs, 2002). Since these direct measures of consumers' emotions, reactions, and status are immediate, unintentional, and natural human responses (Dharmawansa, 2015), researchers may uncover different and significant results compared to self-reported perceptions.

CONCLUSION

VR has become a widely accessible and versatile tool for both consumers and researchers. Its capability to offer immersive, embodied 3D virtual experiences opens up unique opportunities for retail marketing research by allowing studying consumer behaviors in both physical and virtual retail

settings. Despite the increasing popularity of VR, there has been limited research in retail context, and much of the existing research has relied on self-reported data, which may not fully capture the consumer experiences in the virtual immersive universe. Thus, this study highlights two key areas of opportunities for retail marketing research: 1) *research with VR* as a tool to examine consumer behaviors in VR environments that replicate physical retail spaces and 2) *research for VR* as a new retail marketing context, investigating new consumer behaviors unique to virtual worlds. These research topics are crucial for understanding how consumers interact in both physical and virtual 3D retail settings, offering valuable insights for academic research and practical applications.

Further, this study proposes adoption of direct virtual behavioral measurements afforded by VR and advanced VR-compatible behavioral data tracking technologies to supplement psychometric approaches. By capturing immediate and natural human responses—such as eye movements, facial expressions, and head motions—researchers can gain deeper insights into consumer emotions, attention, and reactions. These methods can reveal different and potentially more accurate results than traditional self-report measures, providing a richer understanding of consumer behavior in immersive environments. The integration of advanced tracking technologies in the consumer behavior research areas not only enhances the realism and accuracy of studies but also offers a cost-effective means to manipulate and control various elements within virtual retail spaces. This approach can offer more comprehensive analyses of consumer interactions, ultimately contributing to the development of more effective marketing strategies and retail designs in both real and virtual worlds.

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