



How do augmented reality (AR) and virtual reality (VR) enhance product experiences during online shopping?: A mixed-method approach

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Introduction. The transition from traditional brick-and-mortar retailing to digital retailing has been accelerated with emerging technologies such as augmented reality (AR) and virtual reality (VR) in recent years. In the midst of a pandemic and radical shifts in shopping behavior (Oracle, 2021), online retailers have strived to create unique user experiences with a product, such as superimposing virtual products on the consumer's real-world environment and transporting consumers to the virtual space of a retailer's store. AR and VR lie in the center of these new consumer experiences. Despite the significance of AR and VR technologies in current apparel retailing, limited research has examined the role of these technologies in online apparel retailing. To fill the research gaps, the current study examines the effect of product presentation characteristics of AR (i.e., AR-based virtual try-on) and VR (i.e., a VR-based 3D virtual store) technologies on consumer responses during online shopping. Specifically, Study 1 explores the product presentation characteristics of AR/VR that elicit positive responses through a content analysis of lab data. Study 2 examines a structural model to depict how the characteristics of AR/VR technology that emerged from Study 1 influence consumer responses.

Study 1. Given the lack of research on product presentation characteristics of AR/VR in the apparel context, a qualitative study was designed. We developed two mock e-commerce websites for a fictitious apparel brand to embed virtual try-on and a 3D virtual store. The AR site featured a virtual try-on button on every product page so participants could try on the garment virtually using a webcam. The VR site presented the brand's 3D virtual store in which participants navigate with a mouse and click on different hot spots to move around the space. Two websites were identical except for the type of technology used (virtual try-on vs. a 3D virtual store). A total of 194 female students from a Southwestern U.S. university participated in the lab experiment. Participants were assigned one of the two conditions (virtual try-on or a 3D virtual store) and instructed to explore the assigned technology while completing a simple shopping task. Thereafter, they completed the survey that included open-ended questions asking about their experience and how the presence of virtual try-on or a 3D virtual store affects their shopping experience. The survey responses were content analyzed by two researchers. The data analysis revealed three product presentation characteristics, namely interactivity, product informativeness, and consumption vision. A table below summarizes the three characteristics for virtual try-on and a 3D virtual store along with the participants' sample comments to support each theme.

Characteristics	Virtual try-on (AR)	3D virtual store (VR)
Interactivity	<i>It was like I was controlling it and that I could make the item of clothing different in size in order to fit my body.</i>	<i>I like how I could get closer to items within the store. I also enjoyed that I could click on the specific buttons to navigate around.</i>
Product informativeness	<i>. . . it allows me to see how things fit in different areas . . . because sometimes it can be difficult to tell how an outfit will come together based on images from a website.</i>	<i>I am very indecisive and get nervous about online shopping so being able to see the store and products right in front of me helped me to visualize the apparel.</i>
Consumption vision	<i>It lets you see what it would look like on before you buy it. You get to see what it looks like on your body, how it hugs your curves, and how long and short it is on your frame size.</i>	<i>I liked that you could see the clothes actually hanging up. I feel like this may give customers a better idea of what the clothes look like.</i>

Study 2. Based on the stimulus-organism-response (SOR) model (Mehrabian & Russell, 1974), Study 2 proposes that the three characteristics of AR/VR that emerged from Study 1 influence consumers’ cognitive, affective, and behavioral responses. First, *interactivity*, the extent to which consumers engage with and control the objects (Lowry et al., 2009), may elicit positive consumer responses as it enables consumers to adjust the product size to fit their body (virtual try-on) and to walk around the virtual store to get closer to the garment selected (a 3D virtual store). Second, *product informativeness*, the degree to which AR/VR technology provides helpful product information for purchase decisions (Kowalczyk et al., 2021), may enhance consumer responses because it allows consumers to examine the product as if it is worn on their bodies (virtual try-on) and to provide the richer context of product display in a virtual environment (a 3D virtual store). Third, *consumption vision*, a consumer’s mental images of product-related behaviors and their consequences (Phillips et al., 1995), may elicit positive responses as it provides the images of consumers actually wearing the clothes (virtual try-on) and presents products as if they are displayed in the physical retail store thereby creating vivid mental imagery (a 3D virtual store). As for the consumer response variables, this study uses shopping enjoyment (affective), shopping assist (cognitive), and website attitude and purchase intention (behavioral). In sum, nine hypotheses were proposed as depicted in Figure 1. For Study 2, a total of 303 U.S. female consumers were recruited from a national consumer panel of an online research firm. All measurement items for the research constructs were adopted from previous studies. Confirmatory factor analysis was conducted to test the measurement model using AMOS 26.0. The models for both

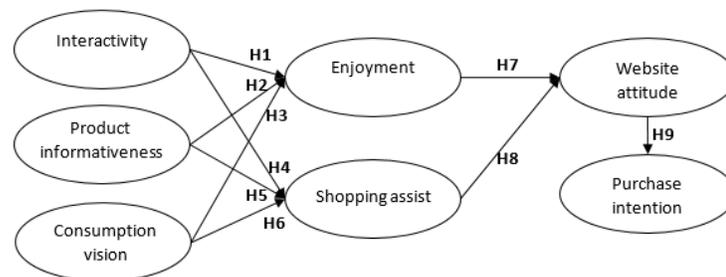


Figure 1. Research model and hypotheses

analysis was conducted to test the measurement model using AMOS 26.0. The models for both

AR and VR data exhibited an acceptable fit as well as convergent/discriminant validity. Then, structural equation modeling examined causal relationships among latent constructs. We found different results between the AR and VR models. For virtual try-on, all hypotheses except H5 and H6 were supported. For a 3D virtual store, all hypotheses except H1, H2, and H5 were supported.

Discussion. This study has several important contributions to the literature. First, through a qualitative analysis, it identifies three product presentation characteristics that can be applied to both virtual try-on and a 3D virtual store. Second, through a further quantitative analysis, it provides implications for researchers and practitioners. For virtual try-on, product informativeness and consumption vision increased enjoyment but not shopping assist. This finding suggests the hedonic (vs. functional) nature of the virtual try-on technology. Perhaps consumers may perceive two-dimensional product visualization on the screen not realistic enough to help them choose the right products. As for a 3D virtual store, the insignificant effect of product informativeness on both enjoyment and shopping assist suggests that a 3D virtual store is not necessarily an effective tool to deliver product information. However, it must be noted that the 3D virtual store used in this study allowed only a limited level of interaction with products (i.e., getting closer to the displayed product). With the increased level of product interaction, such as picking up the product and examining it further, product informativeness for a 3D virtual store may be increased, thereby exerting a significant effect on consumer responses. Future research to utilize a different type of VR technology can examine this relationship further.

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