



Consumer Evaluation of Mobile AR Applications for Shopping: Focusing on 3D Authenticity

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Introduction Augmented Reality (AR) is a technology that puts computer created virtual images to totally overlay real objects in actual time (Zhou, Duh, & Billingham, 2008). Fashion brands expect this technology to reconnect physical and digital retail given that 34% of users would use AR for shopping and 61% would prefer to shop AR-enabled stores according to Google (Arthur, 2017). This innovation aims to make consumer shopping experiences easier, efficient, and economical, however, little research has been done to understand consumer evaluation and use of AR for fashion product shopping. The authenticity of 3D interaction is considered a key feature of AR mobile apps (e.g., Algharabat & Dennis, 2010), and is the focus of this study. The purpose of this study is to examine the effects of the AR mobile apps' 3D authenticity on affective (pleasure and arousal) and cognitive (instrumental value, perceived risk and customer cognitive engagement) responses, which together contribute to consumer attitudinal and behavioral responses to the AR environment.

Theoretical Background and Hypotheses In the context of AR, 3D Authenticity captures a user's cognitive state that 3D based-objects appearing in a computer-mediated shopping platform are perceived as real objects (Algharabat & Dennis, 2009a, 2009b). Algharabat and Dennis published several papers (2009a, 2009b, 2010) that proved the concept of 3D authenticity in a mobile app-mediated shopping environment. They reported that the level of 3D authenticity of a mobile app affects users' overall utilitarian and hedonic values of and further willingness to purchase via the mobile app. Further, the level of authenticity is determined by users' controllability and animated colors of the app. To advance current understanding of authenticity for mobile shopping behavior, this study focuses on two affective states variables (pleasure and arousal) and three cognitive response variables (perceived risk, instrumental value, and cognitive engagement) driving from consumers' experiences with mobile apps for beauty products. Pleasure is a cognitive evaluation about how pleasing people feel about something. Arousal is the level of psychological alertness and individual's activation, and it is related to high-low stimulus activity. In previous research, a mobile AR learning environment was developed for almost realistic wound pattern simulations in medical settings, where learners become emotionally involved in their learning process. (Albrecht, Folta-Schoofs, Behrends, & Von Jan, 2013). During mobile app shopping, such features that help users' controllability and vividness of 3D products would provoke their feelings that the shopping experience is pleasant and sensory stimulated (Algharabat & Dennis, 2009a).

H1. 3D authenticity of an AR mobile app positively affects pleasure (H1a) and arousal (H1b).

Perceived risk associated with AR use is a critical barrier for mobile customers who contemplate mobile shopping. Perceived risk is defined as consumers' perceptions that possible uncertain negative results likely occur from their mobile transactions. Customers tend to perceive technology-mediated shopping to be risky because of the privacy concerns, unpredictability of

shipment time, and/or failure to check the product prior to buy (Bhatnagar, Misra, & Rao, 2000; Liebermann & Stashevsky, 2002). This may be the case for mobile app shopping. Research showed that perceived risk can be lessened by offering high quality of product/information visualization with the 3D technology (Algharabat & Shatnawi, 2014). Likewise, instrumental value, referring to perceived utility and relevance of mobile shopping, can help users make a better, more informed and rational decision (Papagiannidis, See-To, & Bourlakis, 2014). Further, cognitive engagement, which concerns the degree to which a user's participation in and concentration on shopping with a mobile application is intensive, would affect continuance use of mobile application (Tarute, Nikou, & Gatautis, 2017).

H2. 3D authenticity affects perceived risk negatively (H2a), and instrumental value (H2b) and cognitive engagement, positively (H2c).

Empirical evidence supports that affective and cognitive appraisals influence attitude and further buying decisions (Babin, Chebat, & Michon, 2004; Babin, Darden, & Griffin, 1994; Marriott & Williams, 2018). With mobile shopping apps for cosmetics, how they feel and perceive about their shopping experiences will affect their decision-making.

H3. Pleasure (H3a) and arousal (H3b) affect attitude toward the AR mobile application.

H4. Pleasure (H4a) and arousal (H4b) affect mobile app purchase intention.

H5. Perceived risk (H5a), instrumental value (H5b) and cognitive engagement (H5c) affect attitude toward the AR mobile application.

H6. Perceived risk (H6a), instrumental value (H6b) and cognitive engagement (H6c) affect mobile app purchase intention.

Method A web-based survey was undertaken via MTurk for collecting data. Measures of research variables were revised based on previous research. A total of 185 responses from those who had used fashion and beauty AR mobile applications were used ($M_{age} = 31.53$; female = 62.2%). The measurement model was confirmed using CFA (AMOS 23.0). A p-value of less than 0.05 was used for statistical significance testing.

Results Results yield support for H1a, H1b, H2b, H2c, H3a, H3b, H4a, H5a, H5b, H5c, H6b, and H6c. That is, 3D authenticity has a significant impact on pleasure ($t = 7.84$), arousal ($t = 4.77$), instrumental value ($t = 7.97$) and cognitive engagement ($t = 7.75$), but not on perceived risk. Pleasure ($t = 2.99$) and arousal ($t = 2.40$) both influence mobile app attitude. As for cognitive states, perceived risk ($t = -3.53$), instrumental value ($t = 3.15$), and cognitive engagement ($t = 3.39$) influence attitude. Lastly, purchase intention is affected by pleasure ($t = 2.00$), instrumental value ($t = 3.06$), and cognitive engagement ($t = 6.06$), but not by arousal ($t = 1.25$) and perceived risk ($t = -1.21$). Thus, H2a, H4b, H6a were not supported.

Discussion This study makes contribution to the fashion marketing literature by providing empirical evidence that 3D authenticity plays a significant role in consumers' shopping via AR-enabled mobile applications. The role of 3D authenticity in mobile apps is to prompt affective as well as cognitive reactions toward mobile shopping in a positive way, instead to minimize possible negative m-shopping aspects like perceived risk. Our findings provide important implications for application creators or designers by showing the importance of 3D authenticity

in 3D mobile applications. However, there is the convergent validity issue of the arousal construct as a limitation of this research.

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