Journal of Business Research xxx (xxxx) xxx

Contents lists available at ScienceDirect

Journal of Business Research

journal homepage: www.elsevier.com/locate/jbusres

Cognitive, affective, and behavioral consumer responses to augmented reality in e-commerce: A comparative study☆

Pascal Kowalczuk *, Carolin Siepmann (née Scheiben), Jost Adler

University of Duisburg-Essen, Lotharstraße 65, 47057 Duisburg, Germany

ARTICLE INFO

Keywords:
Augmented reality
AR marketing
Perceived reality congruence
Consumer response system
E-commerce
Product presentations

ABSTRACT

This study explores the relative advantage of augmented reality (AR) over web-based product presentations. We develop a consumer response model and compare consumers' reactions to the IKEA Place app and IKEA mobile website on smartphones. The results reveal that AR outperforms web-based product presentations by generating greater immersion and enjoyment, whereas the opposite is true for media usefulness. The findings further show that behavioral responses (reuse and purchase intention) are formed by affective (immersion, enjoyment, product liking) and cognitive (media usefulness, choice confidence) responses to the AR characteristics (interactivity, system quality, product informativeness, reality congruence). Since the reuse intentions of AR apps result from enjoyment and usefulness, retailers should improve system quality, product informativeness, and reality congruence to enhance media usefulness and interactivity to increase enjoyment. To achieve high purchase intentions, they should also increase interactivity, as it boosts product liking and in turn ensures confidence about the chosen products.

1. Introduction

One of the central objectives in today's retailing environments is the creation of superior customer experiences. To achieve effective online experiences, scholars have emphasized the importance of overcoming the physical separation between consumers and products through well-designed digitally enhanced product presentations (Bleier, Harmeling, & Palmatier, 2019). Rapid advances in technology and the strong diffusion of mobile devices provide retailers with more options for presenting their products and increasing these experiences. Augmented reality (AR), an innovative tool that superimposes virtual objects (e.g., images, texts, and sounds) on the user's real environment (Faust et al., 2012), has emerged as one of the most promising options in recent years. AR expands the "physical environment with computer-generated perceptual information, leveraging visual, auditory, haptic, somatosensory, and olfactory modalities" (Roggeveen & Sethuraman, 2018, p. 3) and therefore adds a completely new experience that requires less imagination than even highly vivid web-based product presentations. By integrating AR-based product presentations into their e-commerce channels, retailers can increase customer value and create outstanding experiences across the touch points within the customer journey (Heller, Chylinski, de Ruyter, Mahr, & Keeling, 2019; Lemon & Verhoef, 2016). Among those retailers that have already explored the possibilities of AR are IKEA, Ray-Ban, and Sephora. While IKEA lets consumers place catalog items to give them a real-time scale view of the desired product at their homes, Ray-Ban and Sephora offer magic mirrors to provide consumers with a better impression of how the firms' sunglasses or make-up will look on them. Underlining its huge potential, recent market research anticipates AR to reach a market size of $85 billion in 2025, of which $11.4 billion would account for AR in retailing (Singh, 2019). The expected 1.9 billion monthly active users by 2022 underpin that mobile AR applications, in particular, are becoming increasingly relevant (Tractica, 2017).

Considering the high investments associated with developing and introducing AR, a better understanding is needed of the relative advantage of AR-based product presentations over web-based ones on smartphones to guide retailers on whether it is worth investing in AR. For this reason, this study addresses the following two research questions: 1) What are the relevant characteristics of product presentations on smartphones and how do consumers cognitively, affectively, and behaviorally respond to these characteristics? 2) How do cognitive, affective, and behavioral consumer responses to AR-based and web-based

☆ This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.
* Corresponding author.
E-mail addresses: pascal.kowalczuk@uni-due.de (P. Kowalczuk), carolin.siepmann@uni-due.de (C. Siepmann (née Scheiben)), jost.adler@uni-due.de (J. Adler).

https://doi.org/10.1016/j.jbusres.2020.10.050
Received 30 August 2019; Received in revised form 16 October 2020; Accepted 19 October 2020

product presentations on smartphones differ? To answer these questions, this study builds on the experiential hierarchy model (EHM; Holbrook & Hirschman, 1982) to develop a model that explains through which mechanisms AR characteristics are processed before resulting in behavioral responses and compare the reactions to the IKEA Place app with those to the IKEA mobile website on smartphones.

This research contributes to the literature in several ways. First, despite the relevance and importance of AR for retailing, research examining the relative advantage of AR-based over web-based product presentations is scarce. Instead, the reactions to these product presentation types have been mostly considered in two separate research streams. In the first, scholars (e.g., Algharabat, Alalwan, Rana, & Dwivedi, 2017; Jiang & Benbasat, 2007) have exclusively focused on web-based product presentations by comparing presentations with more vivid, interactive, and three-dimensional content with traditional product presentations comprising static pictures and text descriptions (Wang et al., 2019). In the second stream of the literature, researchers have almost entirely focused on consumer reactions to AR (e.g., Smink, Frowijn, van Reijmersdal, van Noort, & Neijens, 2019). In this branch, only Yim, Chu, and Sauer (2017) and Yim and Park (2019) systematically contrast AR-based with traditional web-based product presentations.

Second, while Yim et al. (2017) focus on two functional mechanisms, namely, vividness and interactivity, this study additionally incorporates informativeness and system quality, which have been proven to be relevant for both AR-based product presentations (e.g., Kim & Hyun, 2016; Rese, Baier, Geyer-Schulz, & Schreiber, 2017) and web-based product presentations (e.g., Bleier et al., 2019; Sohn, 2017; Wang et al., 2019). Beyond that, reality congruence is introduced as a new important factor capturing the extent to which the displayed product matches the real product.

Third, while the AR literature has focused on explaining either the purchase (e.g., Beck & Crié, 2018) or use intention (e.g., Pantano, Rese, & Baier, 2017; Rese et al., 2017), this study contributes to the body of knowledge by examining the interplay of the variables relevant for both and jointly considers them in one model. Hence, this research addresses the important issue that soon, AR will no longer be understood as a means of boosting brand engagement and awareness, but much more attention will be paid to the accountable effects of AR on reuse and purchase intentions as well as sales (BCG, 2018).

Fourth, in the AR literature, only Poushneh and Vasquez-Parraga (2017a, 2017b) explicitly consider the experiential nature of AR. They, however, do not investigate how experiences elicit behavioral consequences. By building on the EHM, this study further contributes to research by taking the information processing as well as experiential nature of product presentations into account. Furthermore, while Javornik (2016) proposes that AR elicits affective, cognitive, and behavioral responses, the underlying mechanisms and their interrelations have been inadequately addressed in extant research. By positing that the input variables are processed by an intervening response system consisting of affective, cognitive, and behavioral responses, the EHM is appropriate for analyzing the reactions to the system characteristics of both AR-based and web-based product presentations.

Finally, prior studies (Yim et al., 2017; Yim & Park, 2019) have investigated consumer reactions to AR and web-based product presentations on personal computers (PCs). Consumers, however, tend to shift from PCs to ubiquitously available mobile devices, especially smartphones, when shopping online. Since these devices are becoming increasingly powerful, they can perform even highly computation-intensive product presentations and thus provide easy and flexible access to the world of AR. Hence, research investigating the relative advantage of AR-based over web-based product presentations on smartphones is not only called for by scholars (Yim et al., 2017), but also timely, necessary, and in line with consumers' current online shopping habits.

The remainder of this paper is organized as follows. In the next section, the theoretical framework is outlined by integrating the EHM into the customer journey (Lemon & Verhoef, 2016), and the existing literature on AR in retail settings is reviewed through the lens of the EHM. In Section 3, the proposed research model, which demonstrates how AR characteristics elicit cognitive, affective, and behavioral consumer responses, is presented. Section 4 outlines the research method, including the study design and data collection. Thereafter, in Section 5, we report the empirical data analysis conducted to test our proposed hypotheses and compare the results for AR-based and web-based product presentations. This paper concludes with a discussion of the findings, implications, as well as limitations and future research directions.

2. Theoretical framework

2.1. AR-based experiences along the customer journey

The customer decision journey is defined as "the process a customer goes through, across all stages and touch points, that makes up the customer experience" (Lemon & Verhoef, 2016, p. 71). This journey is dynamic and iterative, and it extends across the pre-purchase, purchase, and post-purchase stages (Lemon & Verhoef, 2016). Customers experience different touch points on this journey, among which this study focuses on the two most prominent brand- and partner-owned online touch points: mobile apps and browser-accessible mobile websites (Lemon & Verhoef, 2016; Sohn, 2017). Since both touch points allow customers to gather information about products before purchasing them, they are especially relevant for the pre-purchase stage that captures all customer experiences from the initial need recognition to the consideration of satisfying them through purchases (Lemon & Verhoef, 2016). Along this journey, customers engage in the different marketing mix elements provided by the company. AR marketing, the use of AR for marketing purposes (Rauschnabel, Felix, & Hinsch, 2019), provides companies with new opportunities to embellish the classic marketing mix variables of product, price, place, and promotion (Dwivedi et al., 2020). In a B2C context, for example, this means that retailers can use AR to extend existing or create new offerings ("product"), to leverage their e-commerce activities ("place"), and to draw potential customers' attention to their brands and products ("promotion"). While the pricing of AR-based content will become increasingly important for retailers in the future ("price"), AR is currently used as a communication tool in e-commerce that has the ability to generate benefits in the pre-purchase and purchase stages of the customer journey (Rauschnabel et al., 2019).

Since consumers increasingly long for experiences in the marketplace (Pelletier & Collier, 2018), this research builds on the EHM (Holbrook & Hirschman, 1982) to identify and understand consumer responses to mobile AR-based and web-based product presentations. In line with traditional hierarchy models (Lavidge & Steiner, 1961), the EHM posits that environmental or consumer inputs are processed by an intervening response system (Holbrook & Hirschman, 1982). In the EHM, these input variables elicit affective, cognitive, and behavioral responses, leading to output consequences such as real usage and purchase. In contrast to earlier consumer response models, Holbrook and Hirschman (1982) propose that consumers derive value from consumption experiences rather than the good or service itself. From this experience-oriented perspective, they regard consumer responses on the customer journey as being of an information processing or experiential nature. Thus, the EHM and customer journey framework perfectly complement each other.

We review the literature on AR in retail settings (Table 1) to identify the most relevant AR characteristics and show the extent to which they also apply to web-based product presentations. Furthermore, we discuss consumer responses to these characteristics through the lens of the EHM.

2.2. AR characteristics

As shown in Table 2, the extant literature has examined different, but

Table 1
Prior Research on AR in Retailing.

Study	Technology, product, device	AR characteristics	Affective responses	Cognitive responses	Behavioral responses	Individual factors
Kim and Forsythe (2007)	3D vs. virtual try-on, apparel, PC		Entertainment value, attitude toward using	Usefulness, ease of use	Purchase, reuse, and revisit intention	
Kim and Forsythe (2008a)	Sensory enabling technologies (2D, 3D, virtual try-on), apparel, PC		Entertainment value, attitude toward using	Usefulness, ease of use	Actual use, post-use evaluation, purchase	Technology anxiety, innovativeness
Kim and Forsythe (2008b)	Sensory enabling technologies (2D, 3D, virtual try-on), apparel, PC		Entertainment value, attitude toward using	Usefulness, ease of use	Actual use, post-use evaluation, purchase	Technology anxiety, innovativeness
Kim and Forsythe (2009)	Sensory enabling technologies (2D, 3D, virtual try-on), apparel, PC		Entertainment value, attitude toward using	Usefulness, ease of use	Actual use, post-use evaluation, purchase, reuse, and revisit intention	Technology anxiety, innovativeness
Rese et al. (2014)	AR app (IKEA catalog app), furniture, researcher's tablet	Informativeness	Enjoyment, attitude toward using	Usefulness, ease of use	Use intention	
Spreer and Kallweit (2014)	AR app (designed for the study), books, researcher's tablet		Enjoyment	Usefulness, ease of use	Intention to reuse	
Huang and Liao (2015)	Virtual try on, apparel, PC	Aesthetics	Playfulness	Usefulness, Ease of use	Sustainable relationship behavior	Cognitive innovativeness
Javornik (2016)	AR app (IKEA Place), tablet vs. web with virtual elements (IKEA), furniture, PC	Augmentation, control, responsiveness	Flow, application attitude, brand attitude	Thoughts	Purchase intentions, revisit intentions, recommendation intentions	
	Virtual mirror, sunglasses, PC vs. web with static photo try-on, sunglasses, PC	Augmentation, control, responsiveness	Flow, application attitude, brand attitude	Thoughts	Purchase intentions, revisit intentions, recommendation intentions	
Kim and Hyun (2016)	AR app (Ovjet), navigation, smartphone	System quality, information quality, service quality	Telepresence	Usefulness	Reuse intention	
Hilken et al. (2017)	Virtual mirror (Mister Spex), sunglasses, PC	Simulated physical control, environmental embedding	Hedonic value	Utilitarian value		
	Virtual mirror (L'Oréal), make-up, tablet	Simulated physical control, environmental embedding	Hedonic value, spatial presence	Utilitarian value, psychological ownership		
	Virtual mirror (Mister Spex), sunglasses, PC	Simulated physical control, environmental embedding	Hedonic value, spatial presence	Effectiveness, psychological ownership		Involvement, style-of-processing
	Virtual mirror (Mister Spex), sunglasses, PC	Spatial presence		Decision comfort	Word-of-mouth intention	Awareness of privacy practices
Huang and Liao (2017)	Virtual mirror, clothes and accessories, PC		Flow (concentration, playfulness, times distortion, exploratory behavior)	Self-location, haptic imagery, sense of body ownership, ownership control, self-explorative engagement, satisfaction	Time spend on AR	
Pantano et al. (2017)	Virtual mirror (Ray-Ban), PC	Aesthetic quality, interactivity, response time, quality of information	Enjoyment, attitude toward adoption of AR	Usefulness, ease of use	Use intention	
Poushneh and Vasquez-Parraga (2017a)	5 AR entertainment apps (Night Sky Lite; Sky View Free; Star Tracker; Star Chart; Space Journey), 2 retailing groups: virtual mirror (Ray-Ban) vs. virtual model non-AR (Ray-Ban), sunglasses, own smartphones			Consumer satisfaction		Familiarity with internet usage, product knowledge
Poushneh and Vasquez-Parraga (2017b)	Virtual mirror (Ray-Ban), sunglasses, PC	Users information privacy control, aesthetic quality	Hedonic quality	Pragmatic quality, trade-off price and value, user satisfaction	Willingness to buy	
Rese et al. (2017)	AR app (IKEA catalog app), furniture, researcher's tablet AR app (Auto Bild), magazine, own smartphone/ tablet Virtual mirror (Mister Spex), sunglasses, own PC/laptop/ tablet	Informativeness	Enjoyment, attitude toward using	Usefulness, ease of use	Use intention	

(*continued on next page*)

Table 1 (*continued*)

Study	Technology, product, device	AR characteristics	Affective responses	Cognitive responses	Behavioral responses	Individual factors
	Virtual mirror (Ray-Ban), sunglasses, own PC/laptop/tablet					
Yim et al. (2017)	AR app vs. web (sunglasses), PC	Interactivity, vividness, media novelty	Immersion, enjoyment, medium attitude	Media usefulness	Purchase intention	Previous media experience
	AR app vs. web (watches), PC	Interactivity, vividness, media novelty	Immersion, enjoyment, medium attitude	Media usefulness	Purchase intention	Previous media experience
Baek, Yoo, and Yoon (2018)	Virtual mirror (Ray-Ban), sunglasses, PC	Self-viewing vs. other-viewing	Self-brand connections		Purchase intention	
		Self-viewing vs. other-viewing	Self-brand connections		Purchase intention	Narcissism
Beck and Crié (2018)	e-catalog vs. virtual fitting room, apparel, PC				Online patronage intention, online purchase intention	Perceptual curiosity about tool/product, diversive curiosity, involvement, expertise
	E-catalog vs. virtual fitting room, glasses, PC				Offline patronage intention, offline purchase intention	Perceptual curiosity about tool/product, diversive curiosity, involvement, expertise
Poushneh (2018)	Virtual mirror vs. non-AR (both Ray-Ban), sunglasses, PC	Augmentation quality, control of access to personal information		User satisfaction		
	AR entertainment app (Star Chart) vs. non-AR app (Sky Guide), own smartphone					
	AR app (Virtual Hyundai AR) vs. non-AR app (regional Hyundai), automotive, researcher's smartphone/ tablet					
Rauschnabel et al. (2019)	2 AR apps (IKEA Place), furniture and Die Fantastischen Vier (German band), smartphone	Augmentation quality	Attitude toward using the app, inspiration, hedonic benefits, changes in brand attitude	Utilitarian benefits		
Smink et al. (2019)	AR vs. non-AR self vs. non-AR model (Sephora virtual artist), make-up, PC	Informativeness, intrusiveness	Enjoyment, brand attitude		Purchase intention, willingness to share personal data	
Yim and Park (2019)	AR vs. Web, sunglasses, PC		Enjoyment, attitude toward technology	Usefulness	Adoption intention	
This study	AR app (IKEA Place) vs. mobile website (IKEA), furniture, own smartphone	System quality, reality congruence, interactivity, product informativeness	Enjoyment, immersion, product liking	Usefulness, choice confidence	Purchase intention, reuse intention	

Table 2
Categorization of the Investigated AR Characteristics.

Category	Definition	Subsumed constructs	Source
1) Interaction with virtual products	Captures all the constructs that address the extent to which the user can interact with the virtual product (e.g., position, rotate)	Control Simulated physical control Interactivity	Javornik (2016) Hilken et al. (2017) Pantano et al. (2017); Yim et al. (2017)
2) Processing quality	Captures all the constructs that address how accurately, reliably, and promptly AR provides the requested services.	Responsiveness Response time Service and system quality	Javornik (2016) Pantano et al. (2017) Kim and Hyun (2016)
3) Information about virtual products	Captures all the constructs that address the quality and amount of information AR provides about the virtual products.	Quality of information Information quality Informativeness	Pantano et al. (2017) Kim and Hyun (2016) Rese et al. (2014); Rese et al. (2017); Smink et al. (2019)
4) Quality of virtual product presentation	Captures all the constructs that address the graphical visualization quality and environmental embedding of virtual products/objects.	Spatial presence Environmental embedding Vividness Aesthetics Aesthetic quality Augmentation quality Augmentation	Hilken et al. (2017) Hilken et al. (2017) Yim et al. (2017) Huang and Liao (2015) Pantano et al. (2017); Poushneh and Vasquez-Parraga (2017b) Poushneh (2018); Rauschnabel et al. (2019) Javornik (2016)
5) Handling of personal information	Captures all the constructs that address the perception of data and security concerns when using AR.	Information privacy control Control of access to personal information Intrusiveness	Poushneh and Vasquez-Parraga (2017b) Poushneh (2018) Smink et al. (2019)

partly overlapping, AR characteristics, which can be classified into five categories: variables that deal with the 1) interaction with virtual products, 2) processing quality, 3) information about displayed products, 4) quality of virtual product presentation, and 5) handling of personal information.

Interaction with virtual products encompasses control (Javornik, 2016), simulated physical control (Hilken, de Ruyter, Chylinski, Mahr, & Keeling, 2017), and interactivity (Pantano et al., 2017; Yim et al., 2017). Among these, interactivity, defined as the extent to which consumers can directly interact with virtual products (Steuer, 1992), constitutes a core characteristic of immersive experiences (e.g., Pantano et al., 2017; Yim et al., 2017). In an AR context, interactivity reflects the degree to which consumers can position virtual products in their actual physical environment and use 360-degree rotation to inspect them thoroughly. In the web context, interactivity encompasses the visual inspection of product presentations with the help of interactive functions such as rotation, zoom, and enlargement (Algharabat et al., 2017). Although this interaction happens on the user's screen and not in their physical environment, research also regards interactivity as one of the core factors of web-based product presentations (e.g., Fiore, Jin, & Kim, 2005; Jiang & Benbasat, 2007).

The category *processing quality* comprises responsiveness (Javornik, 2016), response time (Pantano et al., 2017), and service and system quality (Kim & Hyun, 2016). In a qualitative study, tom Dieck and Jung (2018) prove the importance of the latter for the adoption of mobile AR technology in the tourism context. As system quality captures the system's capacity to perform accurately and reliably in such a way that it provides the requested services at an adequate processing speed (Kowalczuk, 2018), it contains the relevant quality aspects already considered in the AR literature. In addition, in the context of web-based product presentations, Sohn (2017) demonstrates the relevance of technical and functional quality for mobile online stores. Since a high degree of system quality is required to make both product presentations work, it is a crucial factor constituting the user experience.

Information about virtual products summarizes three similar factors: quality of information (Pantano et al., 2017), information quality (Kim & Hyun, 2016), and informativeness (Rese, Schreiber, & Baier, 2014; Rese et al., 2017; Smink et al., 2019). Following Lim and Ting (2012) and Rese et al. (2014), product informativeness is defined as the degree to which mobile online touch points provide helpful product information for purchase decisions. In online purchases, consumers must typically ground their product choices on less information than for in-store shopping, where they can sensorially experience the offered products. While websites with interactive product presentations enable a virtual exploration of the good (Yoon, Laffey, & Oh, 2008), Poushneh (2018) and Pantano et al. (2017) argue that AR has the potential to compensate for this information deficit by simulating shopping experiences and allowing consumers to directly experience virtual products. Thus, while AR provides additional information by consolidating reality and virtuality, establishing highly informative product presentations is crucial in both contexts.

Further, AR research has shown that the following factors addressing the *quality of virtual product presentations* are relevant for eliciting positive affective and cognitive consumer responses: spatial presence (Hilken et al., 2017), environmental embedding (Hilken et al., 2017), vividness (Yim et al., 2017), aesthetics (Huang & Liao, 2015), aesthetic quality (Pantano et al., 2017; Poushneh & Vasquez-Parraga, 2017b), augmentation quality (Poushneh, 2018; Rauschnabel et al., 2019), and augmentation (Javornik, 2016). While these aspects are mostly concerned with the graphical quality of the displayed products, we argue that not only the quality of the virtual product presentation but also the degree to which the consumer perceives that the augmented product matches the real product is important for eliciting positive consumer reactions. Therefore, this study introduces reality congruence, which beyond quality also comprises the fit between the virtual and real products. In web-based product presentations, 3D authenticity captures this fit between the real and displayed objects (Algharabat et al., 2017; Algharabat & Dennis, 2010). If the product presentations are of poor quality or the wrong size, pixelated, inaccurate, or unrealistic, they do not create value for the customer. For these reasons, reality congruence is important for eliciting positive consumer responses to both product presentation types.

The last category, *handling of personal information,* covers information privacy control (Poushneh & Vasquez-Parraga, 2017b), control of access to personal information (Poushneh, 2018), and intrusiveness (Smink et al., 2019). Research has shown that the use of smart glasses, which automatically and constantly screen the environment, could cause privacy concerns (Rauschnabel, He, & Ro, 2018). However, since mobile AR applications, especially the IKEA Place app, require only time-limited camera access, are directed at the environment, and do not save the recorded content, the last category is less relevant in the context of this study.

2.3. Consumer responses to AR characteristics

The core of the EHM constitutes a comprehensive consumer response system, which consists of affective, cognitive, and behavioral responses.

Each of these dimensions comprises a rational information processing and an experiential perspective considering more subconscious elements (Holbrook & Hirschman, 1982).

Affective responses. In the affective state, the information processing perspective centers on attitudes and preferences, while disregarding experiential hedonic responses. However, emotional reactions are especially key requirements for the application of the experiential perspective (Holbrook & Hirschman, 1982). While, for example, Javornik (2016) examines the attitude toward the brand/app as an affective construct, other researchers have acknowledged the importance of assessing experiential affective responses to AR. As shown in Table 1, they have considered enjoyment and immersion (Yim et al., 2017), flow (Huang & Liao, 2017), and playfulness (Huang & Liao, 2015). In accordance with these studies, this research suggests that the experiential factors of enjoyment and immersion are the focal affective responses to AR. Moreover, product liking, an affective evaluation of the product's design, is assumed to be particularly relevant for AR in retail settings (Cox & Cox, 2002).

Cognitive responses. From an information processing perspective, the cognitive state is determined by memories, knowledge structures, and thoughts (Lavidge & Steiner, 1961). Holbrook and Hirschman (1982) additionally consider more subconscious cognitive elements (e.g., images and fantasies) in the experiential view. Owing to the difficulty of capturing these soft aspects, the extant AR literature (Table 1) has examined the following cognitive responses to AR inherent in the information processing perspective: psychological ownership and decision comfort (Hilken et al., 2017), media usefulness (e.g., Yim et al., 2017), and perceived ease of use (Huang & Liao, 2015; Rese et al., 2014). In line with studies highlighting utilitarian aspects as the most dominant cognitive response, this study focuses on media usefulness. Since AR apps contribute to reducing purchase uncertainty (Dacko, 2017), choice confidence, which has not yet been considered in AR research, is also examined.

Behavioral responses. The experiential perspective recognizes that consumer behavior is driven by the desire for experiences and draws attention to the mental events associated with the act of consumption (Holbrook & Hirschman, 1982). The AR literature has largely focused on the information processing perspective by explaining how AR affects consumers' willingness to buy (Poushneh & Vasquez-Parraga, 2017b) as well as their purchase (e.g., Beck & Crié, 2018; Smink et al., 2019), recommendation (Hilken et al., 2017; Javornik, 2016), use (Pantano et al., 2017; Rese et al., 2017), and reuse intentions (e.g., Javornik, 2016; Kim & Hyun, 2016). This research centers on reuse and purchase intentions, which are especially important for retailers to generate subsequent conversions and revenues in the pre-purchase stage.

3. Model development

3.1. Model overview

A comprehensive model (Fig. 1) is developed to investigate how AR characteristics (interactivity, system quality, product informativeness, and reality congruence) lead to affective (immersion, enjoyment, and product liking) and cognitive (media usefulness and choice confidence) consumer responses. Subsequently, we investigate these affective and cognitive responses as mediators causing changes in the behavioral consumer responses (reuse and purchase intention). The proposed model is assumed to be valid for both AR-based and web-based product presentations. However, in contrast to the latter, AR enables consumers to visually experience, position, and inspect the desired goods in their physical environment. Owing to the utilitarian benefits associated with AR, we hypothesize that consumers perceive cognitive constructs as higher for AR-based than for web-based product presentations. Concerning the hedonic side of AR, we follow Yim et al. (2017) and suggest higher affective consumer responses in the AR than in the web condition. We ultimately assume stronger behavioral responses in the AR condition.

3.2. Affective and cognitive responses to AR characteristics

In the context of vivid product presentations, immersion and enjoyment are conceived as the most relevant affective consumer

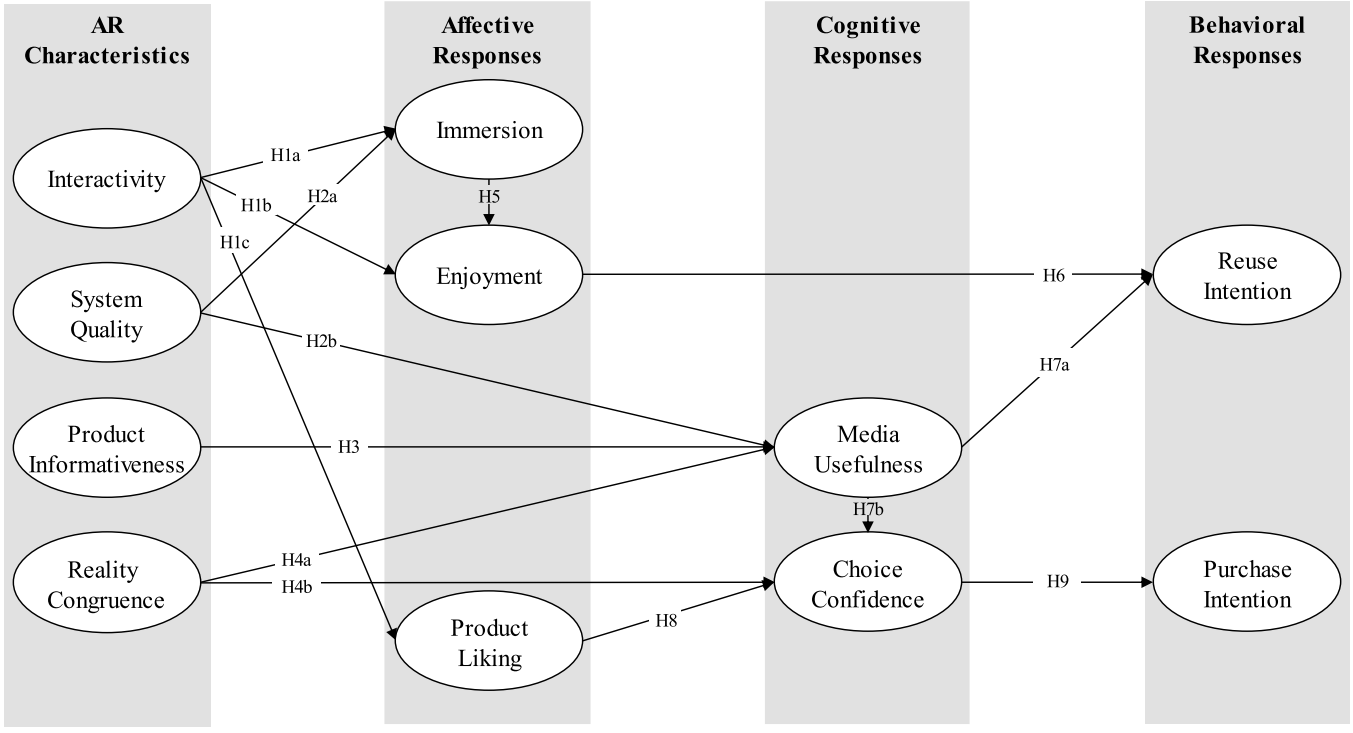


Fig. 1. Conceptual Model.

responses to interactivity. While immersion describes the degree to which AR creates a feeling of being temporarily absorbed by virtual product presentations (Palmer, 1995; Yim et al., 2017), enjoyment is defined as the extent to which the use of AR is perceived as enjoyable in its own right, regardless of the anticipated consequences (Davis, Bagozzi, & Warshaw, 1992). Both are integral parts of the flow construct, which can be defined as the state in which a consumer focuses entirely on the interaction with a medium and screens out irrelevant perceptions (Hoffman & Novak, 1996). Despite an inconsistent understanding of the flow construct (see Drengner, Jahn, and Furchheim (2018) for a comprehensive discussion), research has agreed upon enjoyment and immersion as relevant factors constituting flow (Csikszentmihalyi, 1975). Van Noort, Voorveld, and Van Reijmersdal (2012) show that higher levels of website interactivity induce higher levels of flow. Since Yim et al. (2017) confirm the effect of interactivity on immersion in an AR setting, we also hypothesize that interactivity enhances immersion. The findings on the effect of interactivity on enjoyment, however, are mixed. In contrast to Pantano et al. (2017), who find no support for this effect, Li, Daugherty, and Biocca (2001) state that enjoyment is particularly influenced by the ability to virtually inspect and interactively customize the product presentation. We follow this notion and expect a positive impact of interactivity on enjoyment.

Further, online retailing research confirms that interactivity elicits hedonic values (Yoo, Lee, & Park, 2010), which consist of pleasant feelings while using a product. We argue that the positive feelings that arise from using AR spread from the medium to the product and lead to more positive evaluations, specifically product liking. Product liking comprises an affective evaluation of a chosen product. Research has demonstrated that ownership imagery stimulates psychological ownership and positive product evaluations (Kamleitner & Feuchtl, 2015). Moreover, the effect of ownership on evaluation is presumably even stronger when consumers can interact with virtual products. This interaction leads to greater familiarity with and more positive attitudes toward the product, thereby enhancing product liking.

H1$_{a–c}$. *Interactivity positively affects a) immersion, b) enjoyment, and c) product liking.*

In a virtual reality (VR) context, the quality of experience is composed of user experience and quality of service, of which the latter comprises factors such as response time, reliability, error, and latency (Hamam, Eid, El Saddik, & Georganas, 2008). Since the ultimate quality of experience is total immersion, we argue that smoothly and reliably running AR product presentations are required to create a feeling of being absorbed and expect that system quality is a driver of immersion. Following research on innovative technologies (Yang, Yu, Zo, & Choi, 2016; Kowalczuk, 2018), we posit that media usefulness is a cognitive response to system quality. Media usefulness encompasses the extent to which individuals believe that AR improves their shopping experience in terms of product search, evaluation, and choice quality through decreased time and effort. We assume that consumers perceive AR-based product presentations as more useful the more reliably, accurately, and fluently they are processed. Thus, we follow Kim and Hyun (2016), who demonstrate that system, information, and service quality enhance media usefulness in an AR context.

H2$_{a,b}$. *System quality positively affects a) immersion and b) media usefulness.*

Mobile online touch points aim to provide consumers with purchase relevant information. Research has found that mobile AR apps are perceived as useful because of the information they provide (Olsson, Lagerstam, Kärkkäinen, & Väänänen-Vainio-Mattila, 2013). Moreover, previous AR studies show that information quality (Kim, Hwang, Zo, & Lee, 2016; Pantano et al., 2017; Kim & Hyun, 2016) and perceived informativeness (Rese et al., 2014; Rese et al., 2017) increase perceived usefulness. Hence, product informativeness is a driver of media usefulness.

H3. *Product informativeness positively affects media usefulness.*

The more realistic the product presentation, the better consumers can imagine and inspect the augmented product. This enhances their shopping experience, helps them save time and effort, and thus increases the usefulness of the medium. Yim et al. (2017) identify vividness as an antecedent of media usefulness. Since vividness captures the graphical quality of the displayed products in terms of clearness, sharpness, definition, and level of detail, we suggest a positive impact of reality congruence on media usefulness.

Phillips, Olson, and Baumgartner (1995) state that consumption visions help consumers imagine the future consumption of and interaction with specific products, which in turn increases the confidence of having chosen the right product. Choice confidence "reflects the clarity with which the consumer understands his or her preferences and the extent to which those preferences are believed to be correct" (Andrews, 2013, p. 751). While consumption visions are assumed to be perceived mentally, with AR, consumers can not only mentally but also virtually try and experience products they do not yet own. Furthermore, Poushneh (2018) argues that 3D product presentations can increase certainty while shopping online since they enable consumers to better evaluate the desired product. Hence, we propose a positive effect of reality congruence on choice confidence.

H4$_{a,b}$. *Reality congruence positively affects a) media usefulness and b) choice confidence.*

3.3. Interplay of affective, cognitive, and behavioral responses

Research assumes that individuals highly immersed in an activity do not necessarily perceive positive feelings during the flow experience, but do so afterward (e.g., Mainemelis, 2001; Mainemelis & Dionysiou, 2015). Following this notion, Drengner et al. (2018) propose a process perspective of flow and expect enjoyment to be the outcome of an immersive state. In an AR context, Yim et al. (2017) identify the positive influence of immersion on enjoyment. In line with earlier studies, we conclude that consumers using AR do not have positive feelings while being immersed, but do so afterward.

H5. *Immersion positively affects enjoyment.*

Prior research has identified enjoyment as a main driver of online retail shopping (Childers, Carr, Peck, & Carson, 2001). In a VR context, Domina, Lee, and MacGillivray (2012) find a significant positive effect of enjoyment on shopping intention. In addition, research indicates that enjoyment either directly (Spreer & Kallweit, 2014) or indirectly through attitude toward use positively influences the intention to use AR (Pantano et al., 2017; Yim et al., 2017). In line with this literature, we argue that enjoyment is an important factor for inducing reuse intentions as a behavioral response.

H6. *Enjoyment positively affects reuse intention.*

A further antecedent of reuse intention is media usefulness. Based on uses and gratification theory (Katz, Blumler, & Gurevitch, 1973), Rauschnabel (2018) identifies media usefulness as a cognitive gratification that elicits media usage intentions. Furthermore, in the AR literature, empirical evidence indicates that media and perceived usefulness are major antecedents of use and reuse intentions (Kim et al., 2016; Kim & Hyun, 2016; Pantano et al., 2017; Rese et al., 2014, 2017). Hence, we posit that media usefulness is an additional relevant factor influencing reuse intention.

Owing to the vast number of products available on the Internet, purchase decisions are becoming more complex. Since consumers also feel increasingly time pressured, online retailers face the challenge of providing their customers with appropriate (i.e., relevant yet not superfluous) product information on which consumers can base their purchase decisions (Ariely, 2000). Interactive media such as AR have the potential to solve this problem by allowing consumers to attain virtually

generated information by themselves. Since AR thus helps save time and effort when evaluating a product and improves product search and choice quality, it is reasonable to conclude that AR constitutes a helpful decision aid. In line with Oh, Yoon, and Shyu (2008), who state that interactive decision aids lead to higher choice confidence, we expect a positive influence of media usefulness on choice confidence.

H7$_{a,b}$. *Media usefulness positively affects a) reuse intention and b) choice confidence.*

According to feelings-as-information theory (Schwarz, 2012), the initial affective reactions to an object can be cognitively appraised and they consequently determine the resulting beliefs. Thus, in line with the notion that choice confidence can result from internal processes, inferences, and intuition (Andrews, 2013), we argue that product liking leads to affect-consistent beliefs (Verhagen & Bloemers, 2018) and thus enhances choice confidence.

Furthermore, decision aids decrease the cognitive effort required to make decisions and simultaneously increase decision confidence (Sismeiro & Bucklin, 2004). In contrast to web-based product presentations, VR enables consumers to better imagine and evaluate how products will look in reality (Oh et al., 2008). Since AR further increases imagination by augmenting the product into the real world, we conclude that consumers are even more confident about their chosen product and their final purchase decision.

H8. *Product liking positively affects choice confidence.*

H9. *Choice confidence positively affects purchase intention.*

3.4. Mediating effects

As noted earlier, AR characteristics are assumed to elicit affective and cognitive consumer responses, which in turn affect the relevant behavioral responses. Thus, in the suggested model, the affective responses of immersion, enjoyment, and product liking and the cognitive responses of media usefulness and choice confidence are placed between the AR characteristics and dependent variables. Hence, AR characteristics influence reuse and purchase intention through the affective and cognitive mechanisms in the proposed model, resulting in the following mediations:

H10$_{a,b}$. *The effect of interactivity on reuse intention is mediated by a) immersion and enjoyment and b) enjoyment.*

H10$_{c}$. *The effect of interactivity on purchase intention is mediated by product liking and choice confidence.*

H11$_{a,b}$. *The effect of system quality on reuse intention is mediated by a) immersion and enjoyment and b) media usefulness.*

H11$_{c}$. *The effect of system quality on purchase intention is mediated by media usefulness and choice confidence.*

H12$_{a}$. *The effect of product informativeness on reuse intention is mediated by media usefulness.*

H12$_{b}$. *The effect of product informativeness on purchase intention is mediated by media usefulness and choice confidence.*

H13$_{a}$. *The effect of reality congruence on reuse intention is mediated by media usefulness.*

H13$_{b,c}$. *The effect of reality congruence on purchase intention is mediated by b) media usefulness and choice confidence and c) choice confidence.*

3.5. Control variables

Three control variables are integrated into the basic model to account for individual differences in age, sex, and previous media experience, defined as the degree of a user's familiarity with AR (Yim et al., 2017). Controlling for previous media experience allows us to single out the variations in reuse intention that arise from distinct levels of knowledge about AR. Furthermore, previous research has shown that age and sex affect technology and media use (Correa, Hinsley, & De Zuniga, 2010); these demographic variables are also commonly controlled for in related research fields (Chuah et al., 2016; Rauschnabel, 2018; Rauschnabel et al., 2018).

4. Method

4.1. Data collection

To test the proposed model, a laboratory experiment was conducted with 400 participants recruited at a German university in November and December 2018. Undergraduate students earned extra credits for a marketing course as an incentive for completing the study. In the first step, participants were asked to imagine that they have been hired at the university. They were assigned to one of two conditions and invited to select a desk chair in the price range of €149–250 either by using the IKEA Place AR app or by browsing the IKEA mobile website on their smartphones (Appendix A). In the second step, they completed an online questionnaire. At the beginning of the questionnaire, respondents were asked to indicate the name of the chosen chair to verify that they participated attentively in the experiment. Because of inappropriate responses to this question, two participants were excluded from the sample. Thus, N = 398 participants (55.5% women) remained in the final data set, of which n = 208 used the IKEA Place app and n = 190 the IKEA mobile website. On average, participants were 25.58 years old (SD = 8.68) and indicated being rather experienced in using mobile AR apps (M = 4.35, SD = 2.31).

Studying new media and innovative technologies with students is an established procedure. In the AR context, research has successfully conducted controlled experiments with the IKEA Place app and students (Rauschnabel et al., 2019). Students are also often attracted to new technologies early (Rauschnabel, 2018), and a homogeneous sample increases internal validity, as it may rule out additional exogeneous variables (Chuah et al., 2016).

4.2. Measures

The measurement scales for product informativeness (Rese et al., 2014), media usefulness (Yim et al., 2017), immersion (Yim et al., 2017), interactivity (Pantano et al., 2017), reuse (Kim & Hyun, 2016), and purchase intention (Yim et al., 2017) were adopted from extant AR research. To capture reality congruence, a measure was developed based on the aesthetic quality items of Pantano et al. (2017). Additionally, scales for choice confidence (Oh et al., 2008), product liking (Cox & Cox, 1988), enjoyment (Venkatesh & Bala, 2008), and system quality (Kowalczuk, 2018; Park, Kim, & Ohm, 2015) were included from studies of VR and innovative technologies. All the items were adapted to the AR and web contexts and measured on seven-point Likert or semantic differential scales.

5. Empirical analysis and results

5.1. Measurement model assessment

The proposed model was validated using partial least squares structural equation modeling (PLS-SEM), which focuses on maximizing the explained variance of the endogenous constructs (Henseler, Ringle, & Sarstedt, 2012) and provides robust solutions even for complex models and nonnormally distributed data (Chin & Newsted, 1999; Henseler et al., 2012). SmartPLS 3.2.8 was used to assess the measurement and structural model separately for both conditions (web/app); to contrast the results, a multigroup analysis (MGA) was employed.

One item from each of the scales for system quality and interactivity was excluded to significantly increase the Cronbach's alpha (α) values.

Table 3
Measurement Model: Internal Reliability and Convergent Validity.

Constructs and Items	Stand. Loadings		α		C.R.		AVE	
	AR	Web	AR	Web	AR	Web	AR	Web
Interactivity (Pantano et al., 2017)			**0.82**	**0.78**	**0.89**	**0.87**	**0.74**	**0.70**
Through the interaction with the *virtual* product presentation in the *AR smartphone app* (on the mobile website), I can get a profound picture of the product.	0.871	0.889						
The *virtual* product presentation in the *AR smartphone app* (on the mobile website) has remarkable interaction features.*								
I am able to interact with the *virtual* product presentation in the *AR smartphone app* (on the mobile website) in order to get information tailored to my specific needs.	0.841	0.788						
The degree of interaction with the *virtual* product presentation in the *AR smartphone app* (on the mobile website) is outstanding.	0.861	0.812						
System Quality (Kowalczuk, 2018; Park et al., 2015)			**0.94**	**0.90**	**0.95**	**0.92**	**0.80**	**0.70**
The *AR smartphone app* (mobile website) is promptly responsive to my requests and provides good results.	0.919	0.854						
The *AR smartphone app* (mobile website) performs its functions quickly and efficiently.	0.896	0.843						
The *AR smartphone app* (mobile website) is reliable (it is always up and running, runs without errors, and does what it is supposed to do).	0.898	0.777						
The *AR smartphone app* (mobile website) provides perfect and precise services in line with the purpose of the system.	0.883	0.862						
I assume no limitations or problems in using the *AR smartphone app* (mobile website).*								
The *AR smartphone app* (mobile website) fully meets my needs.	0.866	0.857						
Product Informativeness (Rese et al., 2014)			**0.85**	**0.87**	**0.89**	**0.90**	**0.63**	**0.65**
The *AR smartphone app* (mobile website) shows the information I expected.	0.752	0.784						
The *AR smartphone app* (mobile website) provides detailed information about the products.	0.854	0.849						
The *AR smartphone app* (mobile website) provides complete information about the products.	0.788	0.824						
The *AR smartphone app* (mobile website) provides information that helps me in my decision.	0.832	0.856						
The *AR smartphone app* (mobile website) provides information to compare products.	0.734	0.723						
Reality Congruence (*developed based on* Pantano et al., 2017)			**0.93**	**0.88**	**0.95**	**0.91**	**0.74**	**0.62**
The *AR smartphone app* (mobile website) presents *virtual* products impressively.+	0.864	0.825						
Overall, I find that the *AR smartphone app* (mobile website) presents *virtual* products attractively.	0.849	0.817						
The design of the *virtual* products is visually pleasant.	0.883	0.805						
The *AR smartphone app* (mobile website) presents *virtual* products visually appealingly.	0.910	0.845						
The *AR smartphone app* (mobile website) presents the design of the *virtual* products (e.g., colors, shapes) realistically.	0.842	0.715						
The *AR smartphone app* (mobile website) presents *virtual* products as if they were real.+	0.816	0.722						
Immersion (Yim et al., 2017)			**0.82**	**0.86**	**0.89**	**0.91**	**0.73**	**0.78**
Not deeply engrossed / deeply engrossed	0.835	0.859						
Not absorbed / absorbed	0.847	0.897						
My attention was not focused / my attention was focused	0.878	0.895						
Enjoyment (Venkatesh & Bala, 2008)			**0.89**	**0.78**	**0.93**	**0.87**	**0.82**	**0.70**
I find using the *AR smartphone app* (mobile website) to be enjoyable.	0.900	0.852						
The actual process of using the *AR smartphone app* (mobile website) is pleasant.	0.879	0.763						
I have fun using the *AR smartphone app* (mobile website).	0.931	0.882						
Product Liking (Cox & Cox, 1988)			**0.83**	**0.71**	**0.90**	**0.84**	**0.74**	**0.63**
Bad / good	0.876	0.835						
Unpleasant / pleasant	0.848	0.832						
Unlikable / likable	0.857	0.714						
Media Usefulness (Yim et al., 2017)			**0.90**	**0.88**	**0.92**	**0.91**	**0.71**	**0.67**
The *AR smartphone app* (mobile website) enhances my ability to make product choices more effectively.	0.879	0.806						
Using the *AR smartphone app* (mobile website) saves me time.	0.743	0.753						
Using the *AR smartphone app* (mobile website) improves the quality of my search for products.	0.898	0.875						
The *AR smartphone app* (mobile website) enables me to acquire information more quickly.	0.787	0.830						
Overall, I find the *AR smartphone app* (mobile website) useful in my shopping experience.	0.897	0.836						
Choice Confidence (Oh et al., 2008)			**0.90**	**0.90**	**0.94**	**0.94**	**0.84**	**0.84**
Not satisfied at all / very satisfied+	0.915	0.938						
Not confident at all / very confident	0.940	0.903						
Uncertain / certain	0.891	0.905						
Reuse Intention (Kim & Hyun, 2016)			**0.95**	**0.94**	**0.97**	**0.96**	**0.91**	**0.90**
I intend to reuse the *AR smartphone app* (mobile website).	0.960	0.967						
I predict I will reuse the *AR smartphone app* (mobile website).	0.939	0.907						
I plan to reuse the *AR smartphone app* (mobile website).	0.961	0.969						
Purchase Intention (Yim et al., 2017)			**0.94**	**0.96**	**0.96**	**0.97**	**0.86**	**0.89**
Uncertain / certain	0.910	0.919						
Unlikely / likely	0.925	0.954						
Improbable / probable	0.941	0.945						
Impossible / possible	0.922	0.948						

Note: + new scale item; * item excluded from the scale.

Table 4
Correlations of the Constructs and Square Root of the AVE.

	1	2	3	4	5	6	7	8	9	10	11
Interactivity(1)	***0.831/ 0.858***	0.449	0.541	0.581	0.487	0.478	0.357	0.488	0.469	0.383	0.333
System Quality(2)	0.626	***0.839/ 0.892***	0.500	0.373	0.273	0.444	0.379	0.537	0.340	0.370	0.161
Product Informativeness(3)	0.623	0.530	***0.809/ 0.793***	0.442	0.302	0.417	0.265	0.568	0.277	0.405	0.165
Reality Congruence(4)	0.623	0.484	0.530	***0.790/ 0.861***	0.420	0.385	0.441	0.424	0.462	0.301	0.275
Immersion(5)	0.430	0.452	0.402	0.333	***0.884/ 0.853***	0.516	0.347	0.399	0.355	0.336	0.255
Enjoyment(6)	0.640	0.598	0.497	0.547	0.551	***0.834/ 0.903***	0.300	0.632	0.323	0.461	0.228
Product Liking(7)	0.368	0.330	0.272	0.335	0.193	0.266	***0.796/ 0.860***	0.410	0.616	0.366	0.365
Media Usefulness(8)	0.650	0.633	0.635	0.529	0.555	0.713	0.246	***0.821/ 0.843***	0.403	0.484	0.093
Choice Confidence(9)	0.451	0.426	0.293	0.391	0.268	0.309	0.633	0.365	***0.916/ 0.915***	0.381	0.371
Reuse Intention(10)	0.500	0.413	0.391	0.398	0.416	0.615	0.259	0.608	0.312	***0.948/ 0.953***	0.188
Purchase Intention(11)	0.274	0.257	0.227	0.209	0.066	0.130	0.421	0.225	0.527	0.113	***0.942/ 0.925***

Note: Square root of the AVE is shown in italics on the diagonal. Correlation values for AR (web) are shown below (above) the diagonal.

Table 5
Results of the Mann–Whitney Test.

Constructs	IKEA Place AR app		IKEA mobile website		p
	M	SD	M	SD	
AR Characteristics					
Interactivity	4.85	1.27	4.90	1.13	0.872
System Quality	4.86	1.40	5.58	1.02	0.000
Product Informativeness	4.89	1.11	5.36	1.07	0.000
Reality Congruence	5.07	1.25	5.12	1.06	0.864
Affective Responses					
Immersion	4.70	1.30	4.14	1.35	0.000
Enjoyment	5.35	1.40	4.67	1.29	0.000
Product Liking	5.48	1.03	5.70	0.83	0.059
Cognitive Responses					
Media Usefulness	4.93	1.41	5.49	1.16	0.000
Choice Confidence	5.13	1.14	5.33	1.02	0.074
Behavioral Responses					
Reuse Intention	4.68	1.66	5.21	1.53	0.001
Purchase Intention	4.32	1.71	4.41	1.76	0.495

Note: Means were computed using the aggregate scale values.

As shown in Table 3, after these adjustments, all the constructs exhibited α values higher than 0.70, indicating internal consistency (Nunnally, 1978).

The requirements for convergent validity were met since all the scales exceeded the threshold values of composite reliability (C.R. > 0.70) and average variance extracted (AVE > 0.50) (Hair, Babin, Anderson, & Black, 2014). The high factor loadings of all the items proved the applicability of the scales to our context. Further, discriminant validity was established by employing the Fornell–Larcker criterion (Table 4; Fornell & Larcker, 1981) as well as the heterotrait-monotrait (HTMT) ratio of correlations, where all the reflective constructs were found to be below the threshold value of 0.85 (Henseler, Ringle, & Sarstedt, 2015).

5.2. Descriptive statistics

To investigate the differences between the two forms of product presentation, a nonparametric Mann–Whitney test was applied since a Shapiro–Wilk test indicated that all the variables were nonnormally distributed. Overall, the results in Table 5 imply that the characteristics of system quality and product informativeness, the cognitive response of media usefulness, and the behavioral response of reuse intention achieve significantly higher values in the web condition. On the contrary, the affective responses of immersion and enjoyment are significantly higher rated in the AR condition. Hence, in contrast to the initial assumption, the overall pattern shows that cognitive and behavioral responses are perceived as higher in the web condition and that only affective responses are perceived as higher in the AR condition.

5.3. Structural model assessment

The significances of the path coefficients in the proposed model were assessed separately for both conditions. Fig. 2 displays the parameter estimates.

The results for the AR condition indicate that all hypotheses except for one ($H3_d$) are corroborated and that the AR characteristics positively influence affective consumer responses. Interactivity has a significant effect on immersion ($H1_a$; $\beta_{H1a} = 0.242$; $p \leq 0.01$), enjoyment ($H1_b$; $\beta_{H1b} = 0.494$; $p \leq 0.001$), and product liking ($H1_c$; $\beta_{H1c} = 0.368$; $p \leq 0.001$). The findings further show that system quality enhances immersion ($H2_a$; $\beta_{H2a} = 0.300$; $p \leq 0.001$) and media usefulness ($H2_b$; $\beta_{H2b} = 0.365$; $p \leq 0.001$). The AR characteristic of product informativeness significantly affects media usefulness (H3; $\beta_{H3} = 0.355$; $p \leq 0.001$). While the hypothesized relationship between reality congruence and media usefulness ($H4_a$; $\beta_{H4a} = 0.164$; $p \leq 0.01$) turns out to be significant, the effect on choice confidence is not ($H4_b$; $\beta_{H4b} = 0.118$; $p = 0.062$). Concerning the interrelations of affective responses, the results imply that immersion exerts a significant effect on enjoyment (H5; $\beta_{H5} = 0.338$; $p \leq 0.001$). In terms of behavioral responses, enjoyment (H6; $\beta_{H6} = 0.368$; $p \leq 0.001$) and media usefulness ($H7_a$; $\beta_{H7a} = 0.346$; $p \leq 0.001$) influence reuse intention. In addition, media usefulness ($H7_b$; $\beta_{H7b} = 0.167$; $p \leq 0.05$) and product liking (H8; $\beta_{H8} = 0.552$; $p \leq 0.001$) significantly affect choice confidence, which is a strong predictor of the behavioral response of purchase intention (H9; $\beta_{H9} = 0.527$; $p \leq 0.001$).

In the web condition, three divergent findings emerge. In contrast to the AR condition, no empirical support is found for the effects of system quality on immersion ($H2_a$; $\beta_{H2a} = 0.068$; $p = 0.344$) and media usefulness on choice confidence ($H7_b$; $\beta_{H7b} = 0.123$; $p = .061$). The influence of reality congruence on choice confidence, however, turns out to be significant ($H4_b$; $\beta_{H4b} = 0.199$; $p \leq 0.01$). While both models show an appropriate predictive power for all the dependent variables, more

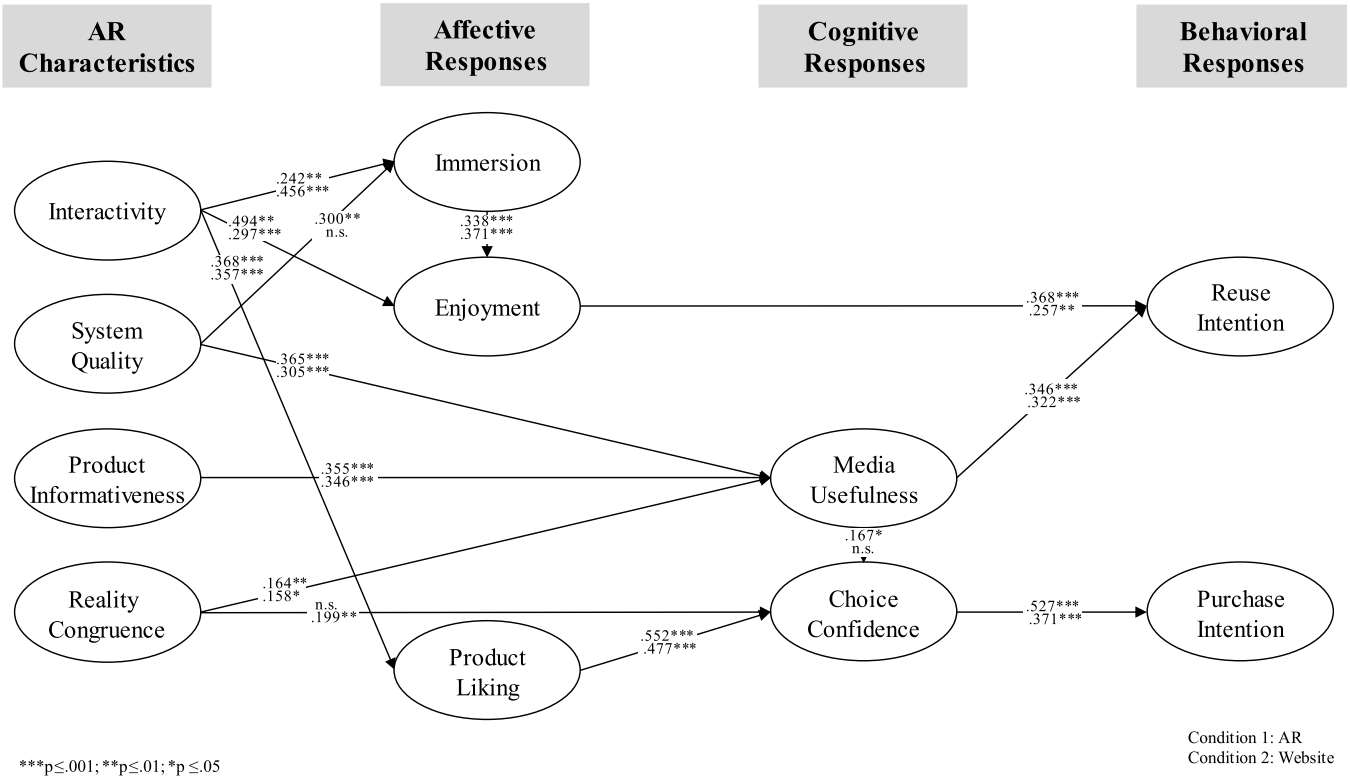


Fig. 2. Model and Results.

Table 6
Mediation Paths: The Impact of AR on Consumer Responses.

Paths	IKEA Place AR app				IKEA mobile website				Mediation
	Path. coeff.	*p*	*t*	SE	Path. coeff.	*p*	*t*	SE	
Interactivity									
H10a → Immersion → Enjoyment → Reuse Intention	0.030	< 0.05	2.48	0.012	0.044	< 0.05	2.28	0.019	✓ / ✓
H10b → Enjoyment → Reuse Intention	0.182	< 0.01	3.95	0.046	0.076	< 0.05	2.22	0.034	✓ / ✓
H10c → Product Liking → Choice Confidence → Purchase Intention	0.107	< 0.01	3.66	0.029	0.063	< 0.01	3.04	0.021	✓ / ✓
System Quality									
H11a → Immersion → Enjoyment → Reuse Intention	0.037	< 0.05	2.16	0.017	0.007	0.422	0.80	0.008	✓ / ×
H11b → Media Usefulness → Reuse Intention	0.126	< 0.01	3.37	0.038	0.098	< 0.01	3.04	0.032	✓ / ✓
H11c → Media Usefulness → Choice Confidence → Purchase Intention	0.032	0.081	1.74	0.018	0.014	0.094	1.68	0.008	× / ×
Product Informativeness									
H12a → Media Usefulness → Reuse Intention	0.123	< 0.01	2.97	0.041	0.111	< 0.01	2.94	0.038	✓ / ✓
H12b → Media Usefulness → Choice Confidence → Purchase Intention	0.031	< 0.05	2.31	0.014	0.016	0.092	1.69	0.009	✓ / ×
Reality Congruence									
H13a → Media Usefulness → Reuse Intention	0.057	< 0.05	2.16	0.026	0.051	0.085	1.73	0.029	✓ / ×
H13b → Media Usefulness → Choice Confidence → Purchase Intention	0.014	0.082	1.74	0.008	0.007	0.207	1.26	0.006	× / ×
H13c → Choice Confidence → Purchase Intention	0.062	0.073	1.79	0.035	0.074	< 0.05	2.52	0.029	× / ✓

variance of reuse ($R^2_{AR} = 0.44$ vs. $R^2_{web} = 0.27$) and purchase intention ($R^2_{AR} = 0.28$ vs. $R^2_{web} = 0.14$) is explained in the AR than in the web condition.

To assess whether the observed differences between both groups are significant, an MGA was conducted. Specifically, the PLS-MGA approach was used, in line with the nonparametric nature of PLS-SEM. The bootstrap results (5,000 samples, no sign changes; two-tailed, $p < 0.05$) show that the effects of interactivity on enjoyment ($H1_b$; $\beta_{|AR\text{-}Web|} = 0.197$; $p = .02$) and system quality on immersion ($H2_a$; $\beta_{|AR\text{-}Web|} = 0.232$; $p = .023$) differ significantly between both conditions (Appendix B).

5.4. Mediation tests

As this study explores the mechanisms through which AR characteristics drive reuse and purchase intention, additional mediation tests

were carried out. Building on the hypotheses that were significant in the overall analysis, several important mediation paths through the cognitive and affective responses for AR-based and web-based product presentations were identified. Testing these mediators provides deeper insights into the mechanisms through which AR characteristics influence behavioral consumer responses. In accordance with Preacher and Hayes (2008), bootstrapping (5,000 samples) was employed to test the hypothesized mediations. Table 6 displays the results of the mediation analysis separately for both product presentation types.

The findings show that all the analyzed AR characteristics exert significant indirect effects on either reuse intention or purchase intention. For AR-based product presentations, purchase intention is driven by the AR characteristics of interactivity ($H10_c$) and product informativeness ($H12_b$). While the first impacts purchase intention via both affective (product liking) and cognitive (choice confidence) responses, the latter is only cognitively processed (media usefulness and choice confidence). The reuse intention of AR-based product presentations is affected by interactivity, system quality, product informativeness, and reality congruence. Interactivity is processed affectively by immersion and enjoyment ($H10_{a,b}$). System quality elicits both affective (immersion) and cognitive (media usefulness) responses, through which it indirectly affects reuse intention ($H11_{a,b}$). The relationships of product informativeness ($H12_a$) and reality congruence ($H13_a$) on reuse intention are purely cognitively mediated through media usefulness. Despite a significant direct effect, the hypothesized mediating effect of media usefulness and choice confidence on the relationship between system quality and purchase intention is not significant ($H11_c$). After accounting for the hypotheses that are not supported, two differences in the web condition emerge. While the hypothesized mediation path of reality congruence through media usefulness on reuse intention is not significant ($H13_a$), the mediating effect of choice confidence on the relationship between reality congruence and purchase intention is significant ($H13_c$).

5.5. Robustness tests

We controlled for the effects of age, sex, and previous media experience on reuse intention. While none of the control variables is significant in the AR condition, previous media experience and sex are significantly related to reuse intention in the web condition. When controlling for these variables, the results of the hypothesized relationships remain stable. To further assess the robustness of the results, supplementary analyses that address nonlinear effects, unobserved heterogeneity, and endogeneity (Sarstedt et al., 2020) were conducted.

First, to test for nonlinear effects, Ramsey (1969) regression equation specification error test (RESET) was applied on the latent variable scores of the original model, as recommended by Sarstedt and Mooi (2019). This test was applied to all the partial regressions in the model.[1] Then, the interaction terms, representing the quadratic effects, were included in the critical regressions (Sarstedt et al., 2020). The bootstrapping results (5,000 samples, no sign changes) indicate no significant nonlinear effects in either condition. Hence, the linear model is robust.

Second, to identify unobserved heterogeneity, which occurs when subgroups exist in the data that produce notably different model estimates (Sarstedt et al., 2020; Hair, Risher, Sarstedt, & Ringle, 2019), a finite mixture (FIMIX) segmentation was employed. Since the indicators do not jointly point to a particular segmentation solution,[2] unobserved heterogeneity is not critical.

Finally, we tested for endogeneity. Measurement errors, simultaneous causality, (un)observed heterogeneity, and omitted variables have been identified as potential roots of endogeneity (Ebbes, Papies, & van Heerde, 2017; Hult et al., 2018). Based on the preceding analysis, measurement errors and heterogeneity were discarded as potential sources of endogeneity; however, concerns remained about omitted variables, which are the most common threat to endogeneity (Hult et al., 2018). In our case, omitted variables could result from not considering consumers' needs for new products and technology optimism, two factors that could affect both the exogeneous and the endogenous variables. Hult et al. (2018) propose dealing with the endogeneity arising from omitted variables in PLS-SEM using a Gaussian copula approach (Park & Gupta, 2012). As the data in the present study are nonnormally distributed, the prerequisite for applying this procedure is fulfilled (Rutz & Watson, 2019). The Web Appendix presents the detailed results of the Gaussian copula approach. The partly significant Gaussian copulas point to a potential endogeneity issue in the effects of media usefulness on choice confidence (AR), interactivity on product liking, and reality congruence on choice confidence (web). These results cast doubt on the significance of $H7_b$ in the AR condition as well as $H4_b$ and H8 in the web condition.

6. Conclusion

6.1. Theoretical implications

This study explores the relative advantage of AR-based over web-based product presentations. In the first step, we compare the mean values of the system characteristics and consumer reactions to the IKEA Place app and IKEA mobile website. In the second step, we apply SEM to reveal the paths by which consumers cognitively, affectively, and behaviorally respond to different system characteristics.

The results of the mean comparisons show that the system characteristics of system quality and product informativeness are perceived as higher for web- than for AR-based product presentations, while no differences exist in terms of interactivity and reality congruence. Participants did not find AR as informative as websites, at least for the chosen product category. Consumers' information needs may explain these results. Since websites offer additional information (e.g., about materials and specifications), they are better suited to satisfy the information demand of potential customers. Therefore, identifying the required information would help improve AR apps. Regarding system quality, websites presumably require less processing speed than computation-intensive AR media, where performance differences become more obvious. Further, reality congruence does not significantly differ between both conditions, indicating that the computer-generated products in the AR app are perceived as equally realistic as the product pictures shown on the mobile website. This implies the high augmentation quality of the tested IKEA Place app.

The results of the mean comparisons further show that AR-based product presentations are superior to web-based product presentations

[1] The RESET implies that two of 10 partial regressions in the AR condition and one of 10 partial regressions in the web condition are subject to nonlinearities (95% confidence interval). Therefore, we ran curve estimations (Sarstedt & Mooi, 2019), finding quadratic relationships between system quality and interactivity on immersion (web).

[2] Owing to the minimum sample size requirements to reliably estimate our model, we considered two- and three segment solutions in our analyses and assessed different segmentation retention criteria (for a detailed discussion, see Sarstedt et al. (2020) and Hair, Sarstedt, Matthews, and Ringle (2016)). For both data sets, AIC3 and CAIC do not point to the same number of segments. For AR, AIC4 and BIC do not unambiguously support one of these solutions and for web, they imply a one-segment solution.

in terms of affective consumer responses. Specifically, the AR condition outperforms the web condition regarding the effects on immersion and enjoyment. These findings are consistent with those obtained by Yim et al. (2017) and they underline the experiential nature of AR. Conversely, concerning cognitive responses, the values for usefulness are higher for web-based product presentations. This implies that consumers perceive lower effectiveness and efficiency when they use AR to search for information in the pre-purchase stage. Consumers may not yet be familiar with the interfaces, features, and novel AR media in general and the established design of a website may save them more time when, for example, searching for purchase relevant information. Another reason could be that AR is not primarily designed to enhance purchase efficiency, but rather increase engagement with products and brands (Rauschnabel et al., 2019). We expect that future diffusion and media experience with AR will increase media usefulness, although results of Yim et al. (2017) do not support this notion. Finally, regarding behavioral responses, higher reuse intentions are observed in the web condition. As consumers are currently more accustomed to choosing and purchasing products on websites than by AR, these results could be explained through habitualization concerning the web channel.

SEM unravels how consumers respond to the system characteristics of interactivity, system quality, product informativeness, and reality congruence of both the AR-based and the web-based product presentations. In both conditions, interactivity elicits the affective responses of immersion, enjoyment, and product liking. The better consumers perceive the possibility to interact with a virtual product, the more they are immersed and caught in the situation and the more they enjoy the technology. The MGA results show that the effect of interactivity on enjoyment is significantly higher for the AR condition than the web condition, whereas the opposite is true for the effect of interactivity on immersion. AR is a completely new experience, where consumers can view virtual products in their actual environment. Thus, we suppose that the interaction with virtual products is of less importance for creating a feeling of being absorbed compared with web-based presentations with static pictures, where much more interactivity is required to create immersive experiences. The model further shows that, in the AR condition, system quality is also a significant driver of immersion, implying that smoothly and reliably running AR presentations are required to create a feeling of being absorbed. This effect is not significant in the web condition, supporting the assumption that the success of web-based product presentations is less dependent on a high processing speed. In both conditions, system quality significantly enhances media usefulness. As system quality is identified as the main driver of usefulness for AR-based product presentations, the usefulness of the system is more pronounced when AR performs accurately and reliably. This finding supports research on innovative technologies (Yang et al., 2016; Kowalczuk, 2018). The finding that product informativeness increases media usefulness is also in line with those of prior AR research (Rese et al., 2014).

This research contributes to the AR literature by integrating reality congruence. Since consumers derive value from using AR through interacting with virtual product presentations, we hypothesize that the success of AR depends on how realistically the virtual product presentations are perceived. To capture the visual appeal and entertainment value of AR, previous studies have examined factors such as aesthetics (Huang & Liao, 2015), aesthetic quality (Pantano et al., 2017), vividness (Yim et al., 2017), augmentation (Javornik, 2016), and augmentation quality (Poushneh, 2018). Reality congruence, however, goes beyond these aspects, as it describes how the virtual fits the real product. For both conditions, the findings show that reality congruence significantly enhances media usefulness, underlining its relevance for online shopping, where consumers rely on a realistic size and shape of the product. By contrast, the results on the effect of reality congruence on choice confidence are less clear. In the AR condition, this effect is insignificant and thus we need to be cautious about the positive effect in the web condition due to the significant Gaussian copulas.

Regarding the interrelations among affective, cognitive, and behavioral responses, our results show that, in both conditions, immersion enhances enjoyment, supporting the process perspective of flow postulated by Drengner et al. (2018). Further, in line with uses and gratification theory, they confirm the importance of utilitarian and hedonic values, as enjoyment and media usefulness increase AR reuse intentions in both conditions. Therefore, this study supports the findings obtained in the extant AR literature (Pantano et al., 2017; Rese et al., 2017).

Although product liking and choice confidence have been proven to be relevant for explaining purchase intentions in online shopping (Flavián, Gurrea, & Orús, 2016; Lee, Hong, & Lee, 2004; Maier & Dost, 2018), prior AR research has widely neglected them. We address this research gap by integrating these constructs into our model. The finding that product liking, which arises from the interaction with a virtual product, increases choice confidence is supported by feelings-as-information theory (Schwarz, 2012).[3] Finally, this research shows that choice confidence has a huge impact on purchase intention.

By conducting mediation analyses, this study establishes the relevance of AR characteristics for not only directly enhancing cognitive and affective responses but also indirectly increasing reuse and purchase intentions. While all the examined characteristics (interactivity, system quality, product informativeness, and reality congruence) indirectly influence reuse intention through the affective and cognitive mechanisms in the AR condition, reality congruence exerts no significant indirect effect on reuse intention in the web condition.

For the indirect effects of the AR characteristics on purchase intention, divergent findings exist. While, in the AR condition, only interactivity and product informativeness have a significant indirect effect on purchase intention, interactivity and reality congruence are especially important for indirectly establishing purchase intentions in the web condition.

Overall, this research addresses two important aspects raised in the AR marketing literature. First, as this study concentrates on the unique aspects of AR, our understanding of AR-specific constructs is deepened (Dwivedi et al., 2020). Second, the results of this study provide support for AR marketing by generating "a profound understanding of user behavior" (Hinsch, Felix, & Rauschnabel, 2020, p. 2).

6.2. Managerial implications

The findings provide valuable implications for retailers and app developers alike. Since AR outperforms product presentations on mobile websites in terms of affective responses, we recommend AR as a valuable extension of the marketing strategy. While maintaining the convenience of online shopping, with AR, retailers offering products such as furniture, fashion, and accessories can integrate a sense of offline shopping into their online channels and provide consumers with the possibility to directly experience and interact with virtual product presentations. This visualization reduces uncertainty and helps consumers make more informed decisions when shopping online. In this regard, companies could benefit from reduced return rates on the part of online shopping affine consumers and reduced webrooming among those who prefer offline shopping.

When deciding to integrate AR into their e-commerce channels, retailers should first ensure that potential customers use and reuse their applications and then motivate consumers to buy their products. Marketers may see the highest adoption of AR when emphasizing both cognitive and affective benefits. In advertisements on their websites or in social media campaigns, retailers should focus on underlining the playful character of AR to reinforce immersion and enjoyment, and

[3] The results of the effects of media usefulness on choice confidence (AR) and reality congruence and product liking on choice confidence (web) should be interpreted with caution because of possible endogeneity issues indicated by the Gaussian copula results.

ultimately enhance the customer experience. Despite exclusively highlighting its hedonic values, retailers should equally focus on the utilitarian aspects (Rauschnabel et al., 2019) of AR by communicating its usefulness. We see a need for action in this regard, as our findings indicate that web-based product presentations score higher on usefulness than AR. Hence, to benefit from AR in the long run, marketers should solve actual customer needs and provide outstanding customer experiences rather than creating short-term buzz with new gimmicks. As a practical example of useful AR content, Hyundai concentrates on customer needs and enhances the value of the customer journey beyond the fun factor by offering an AR-based user manual (CX Network, 2019).

Another important area on which retailers and developers should focus is AR characteristics. To elicit positive cognitive and affective consumer responses and reuse intentions, they should provide promptly responsive AR apps that are informative, interactive, and entail realistic product presentations. For example, IKEA, while making a great contribution toward pushing AR further into mainstream, has not yet managed to supplement its AR app with the full amount of information available on the website (e.g., materials and measurements of the furniture). However, for retailers, it is crucial to identify and provide the key information required for decision making to increase the informativeness and usefulness of AR. App developers should further enhance interactivity by integrating more options to position, adjust, and rotate the shown products. They should also ensure the precise camera alignment of virtual objects to the real world, even under poor light conditions, and steadily enhance the quality and reliability of their AR tools. Only through high system quality can a realistic virtual product presentation be achieved, which in turn increases the usefulness of AR.

Finally, retailers should focus on enhancing customers' choice confidence, as it significantly increases purchase intentions. To generate positive product evaluations and in turn choice confidence, the results imply that they should further improve interactivity. One practical example to increase choice confidence is LEGO's digital box, an AR kiosk in which consumers can see how the assembled LEGO technic product will look. Through this innovation, LEGO has managed to increase engagement and convince visitors to buy its products.

6.3. Limitations and future research directions

Although this study provides meaningful findings and implications, it is not free of limitations. The results are limited to the extent that a convenience sample consisting of college students was used. While this young sample is assumed to be appropriate for studying AR, students are often attracted to new technologies early (Rauschnabel, 2018), limiting the generalizability of the findings. Although a homogeneous sample increases internal validity (Chuah et al., 2016), differences to other age groups could cause external validity issues (Yim et al., 2017). Thus, future research should investigate age-related differences.

By relying on a more exploratory analytical approach (i.e., PLS-SEM) and a convenience sample, the nature of the presented study is rather exploratory. Hence, future research is needed to corroborate our results and causal inferences by, for example, employing covariance-based SEM (see Hair, Babin, and Krey (2017) for an extensive review). In addition, the latter provides a straightforward approach to diagnose and control for endogeneity and would thus be a fruitful extension to this research given the potential endogeneity issues identified with the help of the Gaussian copulas.

Furthermore, Holbrook and Hirschman (1982) emphasize the importance of integrating experiential factors when studying consumer responses. We followed this notion by considering the affective experiential constructs of enjoyment and immersion in the model. Since the results highlight the importance of these affective factors for establishing reuse and purchase intentions, further research is needed to examine if wear-out effects are an important barrier to continuous AR usage and how they could be attenuated. In addition, future research should identify and examine further experiential factors in the cognitive and ultimately in the behavioral states in the AR context. For example, qualitative research is well-suited to shed light on the mental events and private processes associated with the consumption and usage of AR technologies in retailing.

While the findings of this study imply that virtual products are perceived as realistic, future research should examine post-purchase product satisfaction to determine if AR technologies have the potential to decrease return rates in online channels. Since reality congruence significantly affects media usefulness, it is likely that the perceived fit between the virtual and real products is also relevant for other mixed reality and VR technologies. Because this study is based on only one product category, further research should apply the proposed model to other product categories and choice situations.

This study compares two product presentation forms currently offered by one company, which allows us to enhance the external validity of the results and prevent differences in brand preferences or product involvement from altering them. However, as we compare static web-based with AR-based product presentations, we contrast two presentation forms at the opposite ends of an interaction continuum. Since research has already shown differences between static and more vivid product presentations in the web context (e.g., Jiang & Benbasat, 2007), future research should compare reactions between AR and more vivid web-based product presentations. Overall, while AR is still in its infancy, it is considered as a new and promising tool and should therefore be the focus of future retailing research.

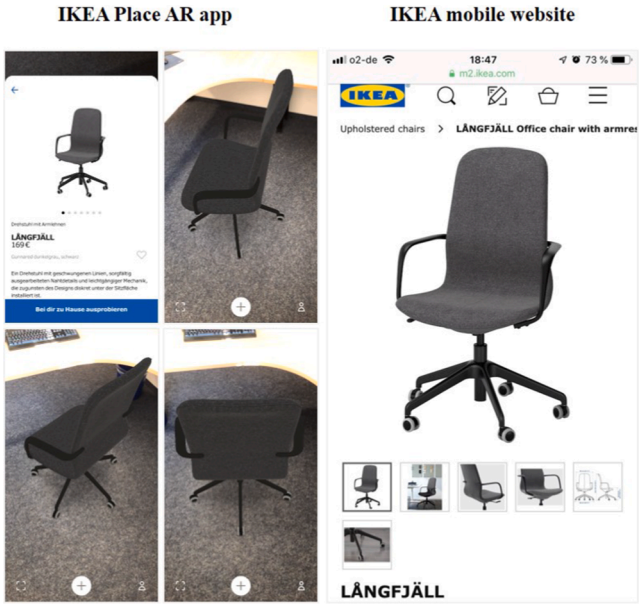
Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Acknowledgements

The authors gratefully acknowledge the valuable feedback from the reviewers, track chairs, and attendees of the 48th EMAC Annual Conference and the 5th International AR & VR Conference (IAVR). We give our special thanks to the anonymous Journal of Business Research reviewers and guest editors for their guidance and suggestions. We furthermore thank the research and the student assistants for their help with data collection.

Appendix A:. Experimental conditions



Appendix B:. Results of the hypothesis tests and multigroup analysis

Hypotheses		IKEA Place AR app				IKEA mobile website				Sig. effects AR/web
		Path. coeff.	p	t	SE	Path. coeff.	p	t	SE	
$H1_a$	Interactivity → Immersion	0.242	< 0.01	2.90	0.084	0.456	< 0.001	6.39	0.071	✓ / ✓*
$H1_b$	Interactivity → Enjoyment	0.494	< 0.001	8.23	0.060	0.297	< 0.001	3.88	0.077	✓ / ✓*
$H1_c$	Interactivity → Product liking	0.368	< 0.001	5.27	0.070	0.357	< 0.001	5.34	0.067	✓ / ✓
$H2_a$	System quality → Immersion	0.300	< 0.001	3.42	0.088	0.068	0.344	0.95	0.072	✓ / ×*
$H2_b$	System quality → Media usefulness	0.365	< 0.001	4.36	0.084	0.305	< 0.001	4.32	0.071	✓ / ✓
$H3$	Product informativeness → Media usefulness	0.355	< 0.001	4.56	0.078	0.346	< 0.001	4.67	0.074	✓ / ✓
$H4_a$	Reality congruence → Media usefulness	0.164	< 0.01	2.66	0.062	0.158	< 0.05	2.09	0.075	✓ / ✓
$H4_b$	Reality congruence → Choice confidence	0.118	0.062	1.86	0.063	0.199	< 0.01	3.12	0.064	□ / ✓**
$H5$	Immersion → Enjoyment	0.338	< 0.001	5.91	0.057	0.371	< 0.001	4.86	0.076	✓ / ✓
$H6$	Enjoyment → Reuse intention	0.368	< 0.001	4.65	0.079	0.257	< 0.01	2.94	0.087	✓ / ✓
$H7_a$	Media usefulness → Reuse intention	0.346	< 0.001	4.48	0.077	0.322	< 0.001	4.20	0.076	✓ / ✓
$H7_b$	Media usefulness → Choice confidence	0.167	< 0.05	2.30	0.073	0.123	0.061	1.88	0.066	✓** / ×
$H8$	Product liking → Choice confidence	0.552	< 0.001	10.44	0.053	0.477	< 0.001	7.35	0.065	✓ / ✓**
$H9$	Choice confidence → Purchase intention	0.527	< 0.001	10.92	0.048	0.371	< 0.001	5.56	0.067	✓ / ✓*

Note: * Significant differences from the MGA (two-tailed; $p < .05$; $p > .95$)** Gaussian copula results point to nonsignificant effects (Web Appendix)

Appendix C. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.jbusres.2020.10.050.

References

Algharabat, R., Alalwan, A. A., Rana, N. P., & Dwivedi, Y. K. (2017). Three dimensional product presentation quality antecedents and their consequences for online retailers: The moderating role of virtual product experience. *Journal of Retailing and Consumer Services, 36*, 203–217. https://doi.org/10.1016/j.jretconser.2017.02.007.

Algharabat, R., & Dennis, C. (2010). Using authentic 3D product visualisation for an electrical online retailer. *Journal of Customer Behaviour, 9*(2), 97–115. https://doi.org/10.1362/147539210X511326.

Andrews, D. (2013). The interplay of information diagnosticity and need for cognitive closure in determining choice confidence. *Psychology & Marketing, 30*(9), 749–764. https://doi.org/10.1002/mar.20643.

Ariely, D. (2000). Controlling the information flow: Effects on consumers' decision making and preferences. *Journal of Consumer Research, 27*(2), 233–248. https://doi.org/10.1086/314322.

Baek, T. H., Yoo, C. Y., & Yoon, S. (2018). Augment yourself through virtual mirror: The impact of self-viewing and narcissism on consumer responses. *International Journal of Advertising, 37*(3), 421–439. https://doi.org/10.1080/02650487.2016.1244887.

BCG. Augmented Reality: Is the Camera the Next Big Thing in Advertising? (2018). http://image-src.bcg.com/Images/BCG-Augmented-Reality-Apr-2018-r_tcm9-188072.pdf Accessed 01 August 2018.

Beck, M., & Crié, D. (2018). I virtually try it… I want it! Virtual Fitting Room: A tool to increase on-line and off-line exploratory behavior, patronage and purchase intentions. *Journal of Retailing and Consumer Services, 40*, 279–286. https://doi.org/10.1016/j.jretconser.2016.08.006.

Bleier, A., Harmeling, C. M., & Palmatier, R. W. (2019). Creating effective online customer experiences. *Journal of Marketing, 83*(2), 98–119. https://doi.org/10.1177/0022242918809930.

Childers, L. T., Carr, L. C., Peck, J., & Carson, S. (2001). Hedonic and utilitarian motivations for online retail shopping behavior. *Journal of Retailing, 77*(4), 511–535. https://doi.org/10.1016/S0022-4359(01)00056-2.

Chin, W. W., & Newsted, P. R. (1999). Structural equation modeling analysis with small samples using partial least squares. *Statistical Strategies for Small Sample Research, 1*(1), 307–341.

Chuah, S. H. W., Rauschnabel, P. A., Krey, N., Nguyen, B., Ramayah, T., & Lade, S. (2016). Wearable technologies: The role of usefulness and visibility in smartwatch adoption. *Computers in Human Behavior, 65*, 276–284. https://doi.org/10.1016/j.chb.2016.07.047.

Correa, T., Hinsley, A. W., & De Zuniga, H. G. (2010). Who interacts on the Web?: The intersection of users' personality and social media use. *Computers in Human Behavior, 26*(2), 247–253. https://doi.org/10.1016/j.chb.2009.09.003.

Cox, D. S., & Cox, A. D. (1988). What does familiarity breed? Complexity as a moderator of repetition effects in advertisement evaluation. *Journal of Consumer Research, 15*(1), 111–116. https://doi.org/10.1086/209149.

Cox, D., & Cox, A. D. (2002). Beyond first impressions: The effects of repeated exposure on consumer liking of visually complex and simple product designs. *Journal of the Academy of Marketing Science, 30*(2), 119–130. https://doi.org/10.1177/03079459994371.

Csikszentmihalyi, M. (1975). *Beyond boredom and anxiety*. San Francisco: Jossey-Bass.

CX Network. 9 Brilliant ways augmented and virtual reality are transforming customer experiences. (2019). https://www.cxnetwork.com/cx-experience/articles/virtual-reality-in-customer-experience Accessed 08 August 2019.

Dacko, S. G. (2017). Enabling smart retail settings via mobile augmented reality shopping apps. *Technological Forecasting and Social Change, 124*, 243–256. https://doi.org/10.1016/j.techfore.2016.09.032.

Davis, F. D., Bagozzi, R. P., & Warshaw, P. R. (1992). Extrinsic and intrinsic motivation to use computers in the workplace. *Journal of Applied Social Psychology, 22*(14), 1111–1132. https://doi.org/10.1111/j.1559-1816.1992.tb00945.x.

Domina, T., Lee, S. E., & MacGillivray, M. (2012). Understanding factors affecting consumer intention to shop in a virtual world. *Journal of Retailing and Consumer Services, 19*(6), 613–620. https://doi.org/10.1016/j.jretconser.2012.08.001.

Drengner, J., Jahn, S., & Furchheim, P. (2018). Flow revisited: Process conceptualization and a novel application to service contexts. *Journal of Service Management, 29*(4), 703–734. https://doi.org/10.1108/JOSM-12-2016-0318.

Dwivedi, Y. K., Ismagilova, E., Hughes, D. L., Carlson, J., Filieri, R., Jacobson, J., … Wang, Y. (2020). Setting the future of digital and social media marketing research: Perspectives and research propositions. *International Journal of Information Management, 102168*. https://doi.org/10.1016/j.ijinfomgt.2020.102168.

Ebbes, P., Papies, D., & van Heerde, H. J. (2017). Dealing with Endogeneity: A Nontechnical Guide for Marketing Researchers. In C. Homburg, M. Klarmann, & A. Vomberg (Eds.), *Handbook of Market Research* (pp. 1–14). Cham, CH: Springer International Publishing.

Faust, F., Roepke, G., Catecati, T., Araujo, F., Ferreira, M. G. G., & Albertazzi, D. (2012). Use of augmented reality in the usability evaluation of products. *Work, 41*(Supplement 1), 1164–1167. https://doi.org/10.3233/WOR-2012-0298-1164.

Fiore, A. M., Jin, H. J., & Kim, J. (2005). For fun and profit: Hedonic value from image interactivity and responses toward an online store. *Psychology & Marketing, 22*(8), 669–694. https://doi.org/10.1002/mar.20079.

Flavián, C., Gurrea, R., & Orús, C. (2016). Choice confidence in the webrooming purchase process: The impact of online positive reviews and the motivation to touch. *Journal of Consumer Behaviour, 15*(5), 459–476. https://doi.org/10.1002/cb.1585.

Fornell, C., & Larcker, D. F. (1981). Evaluating structural equation models with unobservable variables and measurement error. *Journal of Marketing Research, 18*(1), 39–50. https://doi.org/10.1177/002224378101800104.

Hair, J. F., Jr, Babin, B. J., Anderson, R. E., & Black, W. C. (2014). *Multivariate Data Analysis* (7th ed.). Harlow, Essex: Pearson.

Hair, J. F., Jr, Babin, B. J., & Krey, N. (2017). Covariance-based structural equation modeling in the Journal of Advertising: Review and recommendations. *Journal of Advertising, 46*(1), 163–177. https://doi.org/10.1080/00913367.2017.1281777.

Hair, J. F., Risher, J. J., Sarstedt, M., & Ringle, C. M. (2019). When to use and how to report the results of PLS-SEM. *European Business Review, 31*(1), 2–24. https://doi.org/10.1108/EBR-11-2018-0203.

Hair, J. F., Jr, Sarstedt, M., Matthews, L. M., & Ringle, C. M. (2016). Identifying and treating unobserved heterogeneity with FIMIX-PLS: Part I–method. *European Business Review, 28*(1), 63–76. https://doi.org/10.1108/EBR-09-2015-0094.

Hamam, A., Eid, M., El Saddik, A., & Georganas, N. D. (2008). A fuzzy logic system for evaluating quality of experience of haptic-based applications. In International Conference on Human Haptic Sensing and Touch Enabled Computer Applications (pp. 129-138). Springer, Berlin, Heidelberg.

Heller, J., Chylinski, M., de Ruyter, K., Mahr, D., & Keeling, D. I. (2019). Let me imagine that for you: Transforming the retail frontline through augmenting customer mental imagery ability. *Journal of Retailing, 95*(2), 94–114. https://doi.org/10.1016/j.jretai.2019.03.005.

Henseler, J., Ringle, C. M., & Sarstedt, M. (2012). Using partial least squares path modeling in advertising research: Basic concepts and recent issues. In S. Okazaki (Ed.), *Handbook of Research on International Advertising* (pp. 252–276). Cheltenham: Edward Elgar Publishing.

Henseler, J., Ringle, C. M., & Sarstedt, M. (2015). A new criterion for assessing discriminant validity in variance-based structural equation modeling. *Journal of the Academy of Marketing Science, 43*(1), 115–135. https://doi.org/10.1007/s11747-014-0403-8.

Hilken, T., de Ruyter, K., Chylinski, M., Mahr, D., & Keeling, D. I. (2017). Augmenting the eye of the beholder: Exploring the strategic potential of augmented reality to enhance online service experiences. *Journal of the Academy of Marketing Science, 45*(6), 884–905. https://doi.org/10.1007/s11747-017-0541-x.

Hinsch, C., Felix, R., & Rauschnabel, P. A. (2020). Nostalgia beats the wow-effect: Inspiration, awe and meaningful associations in augmented reality marketing. *Journal of Retailing and Consumer Services, 53*, Article 101987. https://doi.org/10.1016/j.jretconser.2019.101987.

Hoffman, D. L., & Novak, T. P. (1996). Marketing in hypermedia computer-mediated environments: Conceptual foundations. *Journal of Marketing, 60*(3), 50–68.

Holbrook, M. B., & Hirschman, E. C. (1982). The experiential aspects of consumption: Consumer fantasies, feelings, and fun. *Journal of Consumer Research, 9*(2), 132–140. https://doi.org/10.1086/208906.

Huang, T. L., & Liao, S. (2015). A model of acceptance of augmented-reality interactive technology: The moderating role of cognitive innovativeness. *Electronic Commerce Research, 15*(2), 269–295. https://doi.org/10.1007/s10660-014-9163-2.

Huang, T. L., & Liao, S. L. (2017). Creating e-shopping multisensory flow experience through augmented-reality interactive technology. *Internet Research, 27*(2), 449–475. https://doi.org/10.1108/IntR-11-2015-0321.

Hult, G. T. M., Hair, J. F., Jr, Proksch, D., Sarstedt, M., Pinkwart, A., & Ringle, C. M. (2018). Addressing endogeneity in international marketing applications of partial least squares structural equation modeling. *Journal of International Marketing, 26*(3), 1–21. https://doi.org/10.1509/jim.17.0151.

Javornik, A. (2016). "It's an illusion, but it looks real!" Consumer affective, cognitive and behavioural responses to augmented reality applications. *Journal of Marketing Management, 32*(9–10), 987–1011. https://doi.org/10.1080/0267257X.2016.1174726.

Jiang, Z., & Benbasat, I. (2007). Research note—investigating the influence of the functional mechanisms of online product presentations. *Information Systems Research, 18*(4), 454–470. https://doi.org/10.1287/isre.1070.0124.

Kamleitner, B., & Feuchtl, S. (2015). "As if it were mine": Imagery works by inducing psychological ownership. *Journal of Marketing Theory and Practice, 23*(2), 208–223.

Katz, E., Blumler, J. G., & Gurevitch, M. (1973). Uses and gratifications research. *The Public Opinion Quarterly, 37*(4), 509–523.

Kim, H. C., & Hyun, M. Y. (2016). Predicting the use of smartphone-based augmented reality (AR): Does telepresence really help? *Computers in Human Behavior, 59*, 28–38. https://doi.org/10.1016/j.chb.2016.01.001.

Kim, J., & Forsythe, S. (2007). Hedonic usage of product virtualization technologies in online apparel shopping. *International Journal of Retail & Distribution Management, 35*(6), 502–514. https://doi.org/10.1108/09590550710750368.

Kim, J., & Forsythe, S. (2008a). Adoption of virtual try-on technology for online apparel shopping. *Journal of Interactive Marketing, 22*(2), 45–59. https://doi.org/10.1002/dir.20113.

Kim, J., & Forsythe, S. (2008b). Sensory enabling technology acceptance model (SE-TAM): A multiple-group structural model comparison. *Psychology & Marketing, 25*(9), 901–922. https://doi.org/10.1002/mar.20245.

Kim, J., & Forsythe, S. (2009). Adoption of sensory enabling technology for online apparel shopping. *European Journal of Marketing, 43*(9/10), 1101–1120. https://doi.org/10.1108/03090560910976384.

Kim, K., Hwang, J., Zo, H., & Lee, H. (2016). Understanding users' continuance intention toward smartphone augmented reality applications. *Information Development, 32*(2), 161–174. https://doi.org/10.1177/0266666914535119.

Kowalczuk, P. (2018). Consumer acceptance of smart speakers: A mixed methods approach. *Journal of Research in Interactive Marketing, 12*(4), 418–431. https://doi.org/10.1108/JRIM-01-2018-0022.

Lavidge, R. J., & Steiner, G. A. (1961). A model for predictive measurements of advertising effectiveness. *Journal of Marketing, 25*(6), 59–62. https://doi.org/10.1177/002224296102500611.

Lee, B. K., Hong, J. Y., & Lee, W. N. (2004). How attitude toward the web site influences consumer brand choice and confidence while shopping online. *Journal of Computer-Mediated Communication, 9*(2), 923. https://doi.org/10.1111/j.1083-6101.2004.tb00282.x.

Lemon, K. N., & Verhoef, P. C. (2016). Understanding customer experience throughout the customer journey. *Journal of Marketing, 80*(6), 69–96. https://doi.org/10.1509/jm.15.0420.

Li, H., Daugherty, T., & Biocca, F. (2001). Characteristics of virtual experience in electronic commerce: A protocol analysis. *Journal of Interactive Marketing, 15*(3), 13–30. https://doi.org/10.1002/dir.1013.

Lim, W. M., & Ting, D. H. (2012). E-shopping: An analysis of the uses and gratifications theory. *Modern Applied Science, 6*(5), 48–63. https://doi.org/10.5539/mas.v6n4p49.

Maier, E., & Dost, F. (2018). The positive effect of contextual image backgrounds on fluency and liking. *Journal of Retailing and Consumer Services, 40*, 109–116. https://doi.org/10.1016/j.jretconser.2017.09.003.

Mainemelis, C. (2001). When the muse takes it all: A model for the experience of timelessness in organizations. *Academy of Management Review, 26*(4), 548–565. https://doi.org/10.5465/amr.2001.5393891.

Mainemelis, C., & Dionysiou, D. D. (2015). Play, flow, and timelessness. In C. Shalley, M. Hitt, & J. Zhou (Eds.), *The Oxford Handbook of creativity, innovation, and entrepreneurship* (pp. 121–140). New York: Oxford University Press.

Nunnally, J. C. (1978). Psychometric theory. New York: McGraw-Hill.

Oh, H., Yoon, S. Y., & Shyu, C. R. (2008). How can virtual reality reshape furniture retailing? *Clothing and Textiles Research Journal, 26*(2), 143–163. https://doi.org/10.1177/0887302X08314789.

Olsson, T., Lagerstam, E., Kärkkäinen, T., & Väänänen-Vainio-Mattila, K. (2013). Expected user experience of mobile augmented reality services: A user study in the context of shopping centres. *Personal and Ubiquitous Computing, 17*(2), 287–304. https://doi.org/10.1007/s00779-011-0494-x.

Palmer, M. T. (1995). Interpersonal communication and virtual reality: Mediating interpersonal relationships. In F. Biocca, & M. R. Levy (Eds.), *Communication in the Age of Virtual Reality* (pp. 277–302). Hillsdale, NJ: Erlbaum.

Pantano, E., Rese, A., & Baier, D. (2017). Enhancing the online decision-making process by using augmented reality: A two country comparison of youth markets. *Journal of Retailing and Consumer Services, 38*, 81–95. https://doi.org/10.1016/j.jretconser.2017.05.011.

Park, E., Kim, H., & Ohm, J. Y. (2015). Understanding driver adoption of car navigation systems using the extended technology acceptance model. *Behaviour and Information Technology, 34*(7), 741–751. https://doi.org/10.1080/0144929X.2014.963672.

Park, S., & Gupta, S. (2012). Handling endogenous regressors by joint estimation using copulas. *Marketing Science, 31*(4), 567–586. https://doi.org/10.1287/mksc.1120.0718.

Pelletier, M. J., & Collier, J. E. (2018). Experiential purchase quality: Exploring the dimensions and outcomes of highly memorable experiential purchases. *Journal of Service Research, 21*(4), 456–473. https://doi.org/10.1177/1094670518770042.

Phillips, D. M., Olson, J. C., & Baumgartner, H. (1995). Consumption visions in consumer decision making. In F. Kardes, & M. Sujan (Eds.), *Advances in Consumer Research* (pp. 280–284). Provo, UT: Association for Consumer Research.

Poushneh, A. (2018). Augmented reality in retail: A trade-off between user's control of access to personal information and augmentation quality. *Journal of Retailing and Consumer Services, 41*, 169–176. https://doi.org/10.1016/j.jretconser.2017.12.010.

Poushneh, A., & Vasquez-Parraga, A. Z. (2017a). Customer dissatisfaction and satisfaction with augmented reality in shopping and entertainment. *Journal of Consumer Satisfaction, Dissatisfaction & Complaining Behavior, 30*, 97–118.

Poushneh, A., & Vasquez-Parraga, A. Z. (2017b). Discernible impact of augmented reality on retail customer's experience, satisfaction and willingness to buy. *Journal of Retailing and Consumer Services, 34*, 229–234. https://doi.org/10.1016/j.jretconser.2016.10.005.

Preacher, K. J., & Hayes, A. F. (2008). Asymptotic and resampling strategies for assessing and comparing indirect effects in multiple mediator models. *Behavior Research Methods, 40*(3), 879–891. https://doi.org/10.3758/BRM.40.3.879.

Ramsey, J. B. (1969). Tests for specification errors in classical linear least-squares regression analysis. *Journal of the Royal Statistical Society: Series B (Methodological), 31*(2), 350–371. https://doi.org/10.1111/j.2517-6161.1969.tb00796.x.

Rauschnabel, P. A. (2018). Virtually enhancing the real world with holograms: An exploration of expected gratifications of using augmented reality smart glasses. *Psychology & Marketing, 35*(8), 557–572. https://doi.org/10.1002/mar.21106.

Rauschnabel, P. A., Felix, R., & Hinsch, C. (2019). Augmented reality marketing: How mobile AR-apps can improve brands through inspiration. *Journal of Retailing and Consumer Services, 49*, 43–53. https://doi.org/10.1016/j.jretconser.2019.03.004.

Rauschnabel, P. A., He, J., & Ro, Y. K. (2018). Antecedents to the adoption of augmented reality smart glasses: A closer look at privacy risks. *Journal of Business Research, 92*, 374–384. https://doi.org/10.1016/j.jbusres.2018.08.008.

Rese, A., Baier, D., Geyer-Schulz, A., & Schreiber, S. (2017). How augmented reality apps are accepted by consumers: A comparative analysis using scales and opinions. *Technological Forecasting and Social Change, 124*, 306–319. https://doi.org/10.1016/j.techfore.2016.10.010.

Rese, A., Schreiber, S., & Baier, D. (2014). Technology acceptance modeling of augmented reality at the point of sale: Can surveys be replaced by an analysis of online reviews? *Journal of Retailing and Consumer Services, 21*(5), 869–876. https://doi.org/10.1016/j.jretconser.2014.02.011.

Roggeveen, A. L., & Sethuraman, R. (2018). Understanding the JR heritage, publishing in JR, and the evolving retail field. *Journal of Retailing, 94*(1), 1–4. https://doi.org/10.1016/j.jretai.2018.02.001.

Rutz, O. J., & Watson, G. F. (2019). Endogeneity and marketing strategy research: an overview. Journal of the Academy of Marketing Science, 47(3), 479-498. 10.1007/s11747-019-00630-4.

Sarstedt, M., & Mooi, E. (2019). Regression Analysis. In *A Concise Guide to Market Research* (pp. 209–256). Berlin, Heidelberg: Springer.

Sarstedt, M., Ringle, C. M., Cheah, J. H., Ting, H., Moisescu, O. I., & Radomir, L. (2020). Structural model robustness checks in PLS-SEM. *Tourism Economics, 26*(4), 531–554. https://doi.org/10.1177/1354816618823921.

Schwarz, N. (2012). Feelings-as-information theory. In P. A. M. Van Lange, A. Kruglanski, & E. T. Higgins (Eds.), Handbook of theories of social psychology (pp. 289–308). Thousand Oaks, CA: Sage.

Singh, S. Augmented Reality Market worth $85.0 billion by 2025. (2019). https://www.marketsandmarkets.com/PressReleases/augmented-reality.asp Accessed 01 August 2019.

Sismeiro, C., & Bucklin, R. E. (2004). Modeling purchase behavior at an e-commerce web site: A task-completion approach. *Journal of Marketing Research, 41*(3), 306–323. https://doi.org/10.1509/jmkr.41.3.306.35985.

Smink, A. R., Frowijn, S., van Reijmersdal, E. A., van Noort, G., & Neijens, P. C. (2019). Try online before you buy: How does shopping with augmented reality affect brand responses and personal data disclosure. *Electronic Commerce Research and Applications, 35*, Article 100854. https://doi.org/10.1016/j.elerap.2019.100854.

Sohn, S. (2017). A contextual perspective on consumers' perceived usefulness: The case of mobile online shopping. *Journal of Retailing and Consumer Services, 38*, 22–33. https://doi.org/10.1016/j.jretconser.2017.05.002.

Spreer, P., & Kallweit, K. (2014). Augmented reality in retail: Assessing the acceptance and potential for multimedia product presentation at the PoS. *Transactions on Marketing Research, 1*(1), 20–35.

Steuer, J. (1992). Defining virtual reality: Dimensions determining telepresence. *Journal of Communication, 42*(4), 73–93. https://doi.org/10.1111/j.1460-2466.1992.tb00812.x.

tom Dieck, M. C., & Jung, T. (2018). A theoretical model of mobile augmented reality acceptance in urban heritage tourism. Current Issues in Tourism, 21(2), 154-174. 10.1080/13683500.2015.1070801.

Tractica. Mobile Augmented Reality Market to Reach 1.9 Billion Unique Monthly Active Users by 2022. (2017). https://www.tractica.com/newsroom/press-releases/mobile-augmented-reality-market-to-reach-1-9-billion-unique-monthly-active-users-by-2022-according-to-tractica/ Accessed 01 August 2019.

Van Noort, G., Voorveld, H. A., & Van Reijmersdal, E. A. (2012). Interactivity in brand web sites: Cognitive, affective, and behavioral responses explained by consumers' online flow experience. *Journal of Interactive Marketing, 26*(4), 223–234. https://doi.org/10.1016/j.intmar.2011.11.002.

Venkatesh, V., & Bala, H. (2008). Technology acceptance model 3 and a research agenda on interventions. *Decision Sciences, 39*(2), 273–315. https://doi.org/10.1111/j.1540-5915.2008.00192.x.

Verhagen, T., & Bloemers, D. (2018). Exploring the cognitive and affective bases of online purchase intentions: A hierarchical test across product types. *Electronic Commerce Research, 18*(3), 537–561. https://doi.org/10.1007/s10660-017-9270-y.

Wang, Y. S., Yeh, C. H., Wang, Y. M., Tseng, T. H., Lin, H. H., Lin, S., & Xie, M. Q. (2019). Investigating online consumers' responses to product presentation modes. *Internet Research, 29*(6), 1233–1255. https://doi.org/10.1108/INTR-07-2017-0258.

Yang, H., Yu, J., Zo, H., & Choi, M. (2016). User acceptance of wearable devices: An extended perspective of perceived value. *Telematics and Informatics, 33*(2), 256–269. https://doi.org/10.1016/j.tele.2015.08.007.

Yim, M. Y. C., & Park, S. Y. (2019). "I am not satisfied with my body, so I like augmented reality (AR)": Consumer responses to AR-based product presentations. *Journal of Business Research, 100*, 581–589. https://doi.org/10.1016/j.jbusres.2018.10.041.

Yim, M. Y. C., Chu, S. C., & Sauer, P. L. (2017). Is augmented reality technology an effective tool for e-commerce? An interactivity and vividness perspective. *Journal of Interactive Marketing, 39*, 89–103. https://doi.org/10.1016/j.intmar.2017.04.001.

Yoo, W. S., Lee, Y., & Park, J. (2010). The role of interactivity in e-tailing: Creating value and increasing satisfaction. *Journal of Retailing and Consumer Services, 17*(2), 89–96. https://doi.org/10.1016/j.jretconser.2009.10.003.

Yoon, S. Y., Laffey, J., & Oh, H. (2008). Understanding usability and user experience of web-based 3D graphics technology. *International Journal of Human-Computer Interaction, 24*(3), 288–306. https://doi.org/10.1080/10447310801920516.

Pascal Kowalczuk is a PhD candidate and research assistant at the Chair of Marketing of the University of Duisburg-Essen, Germany. His research focuses on technology acceptance of innovative products and augmented reality in marketing.

Carolin Siepmann (née Scheiben) is a PhD candidate and research assistant at the Chair of Marketing of the University of Duisburg-Essen, Germany. Her research interests cover several fields of consumer behavior.

Jost Adler, PhD, Professor of Marketing at the University of Duisburg-Essen, Germany. He received his PhD from the University of Trier, Germany. His research focuses on customer base analysis and modeling of consumer behavior.