



**HAL**  
open science

# The roles of perceived risk, attractiveness of the online store and familiarity with AR in the influence of AR on patronage intention

Gaël Bonnin

► **To cite this version:**

Gaël Bonnin. The roles of perceived risk, attractiveness of the online store and familiarity with AR in the influence of AR on patronage intention. *Journal of retailing and consumer services*, 2020, 52, pp.101938 -. 10.1016/j.jretconser.2019.101938 . hal-03488310

**HAL Id: hal-03488310**

**<https://hal.science/hal-03488310>**

Submitted on 20 Jul 2022

**HAL** is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.



Distributed under a Creative Commons Attribution - NonCommercial 4.0 International License

## **The roles of perceived risk, attractiveness of the online store and familiarity with AR in the influence of AR on patronage intention**

Author

Gaël Bonnin

Marketing Professor, NEOMA Business School

Head of Smart Product & Consumption Research Institute, NEOMA Business School

Research Associate, REGARDS Research Center, Champagne-Ardennes University

59 rue Pierre Taittinger, 51 100 Reims

[gael.bonnin@neoma-bs.fr](mailto:gael.bonnin@neoma-bs.fr)

### **Abstract**

Augmented reality has raised considerable interest over the last few years. But the questions of its benefits for online retailer is still pending. Research has shown that AR has a positive influence on patronage and purchase behavior intention via hedonic and utilitarian evaluation. The goal of this research is to extend previous works by integrating the mediating roles of perceived risk of buying a product on the online store and of attractiveness of the online store. It is also to study the moderating role of familiarity with AR. Two experiments confirm the crucial role of perceived risk in the influence of AR on patronage intention. Moreover, the more people are familiar with AR, the more AR decreases perceived risk and increases patronage intention.

**Keywords** Augmented reality; perceived risk; online store; hype

**The roles of perceived risk, attractiveness of the online store  
and familiarity with AR in the influence of AR on  
patronage intention**

**Abstract**

Augmented reality has raised considerable interest over the last few years. But the questions of its benefits for online retailer is still pending. Research has shown that AR has a positive influence on patronage and purchase behavior intention via hedonic and utilitarian evaluation. The goal of this research is to extend previous works by integrating the mediating roles of perceived risk of buying a product on the online store and of attractiveness of the online store. It is also to study the moderating role of familiarity with AR. Two experiments confirm the crucial role of perceived risk in the influence of AR on patronage intention. Moreover, the more people are familiar with AR, the more AR decreases perceived risk and increases patronage intention.

**Keywords** Augmented reality; perceived risk; online store; hype

**The roles of perceived risk, attractiveness of the online store  
and familiarity with AR in the influence of AR on  
patronage intention**

**1. Introduction**

In spite of its popularity, augmented reality (AR), defined as technologies in which “the display of an otherwise real environment is augmented by means of virtual (computer graphic) objects’ (Milgram and Kishino, 1994), fails to reach mass adoption: according to a survey of the Digital Marketing Institute in 2017, 60% of firms are currently not using AR and Gartner, in the 2018 edition of its hype cycle of emerging technologies, still sees AR as being in the “trough of disillusionment”, a phase where a technology is perceived as not holding on to its promises. Retail managers need to know what benefits they can expect from using AR on their e-commerce site before investing in this technology: will it drive traffic? will it improve their image? will it last beyond the “hype” effect and when consumers become familiar with the technology?

To these questions, research offers only limited answers.

First, if the adoption of AR by consumers begins to be well documented (e.g. Kim & Forsythe, 2008) and if a few studies have been conducted on the expectations toward AR in online

commerce (e.g. Dacko, 2017; Olsson et al., 2013), research on the process of influence of AR applications on online store visitors is still rare. The few studies on the topic have demonstrated that AR increases consumer satisfaction (Poushneh, 2018), willingness to buy (Beck and Crié, 2018; Yim et al., 2017) or the intention to visit online stores (Beck and Crié, 2018; Hilken et al., 2017; Pantano et al., 2017; Poushneh and Vasquez-Parraga, 2017). This impact of AR on these variables is mediated by increases in hedonic and utilitarian experiences with the web site (Beck and Crié, 2018; Hilken et al., 2017; Poushneh and Vasquez-Parraga, 2017; Yim et al., 2017) as well as by a greater comfort in the decision making process (Hilken et al., 2017).

The objective of this research is to extend these results by integrating three variables as yet overlooked by previous research and thus to contribute to the knowledge of the process variables and boundary conditions pertaining to the influence of AR on online shoppers.

First, we integrate the perceived risk of making an online purchase. This is of primary importance because the influence of AR on perceived risk has not been empirically studied, although online purchase is still perceived as a risky behavior by consumers (Beck and Crié, 2018; Cheng et al., 2008; Pappas, 2016) and although it has been proposed that AR could decrease the perceived risk of making a purchase online (Beck

and Crié, 2018; Kim and Forsythe, 2009; Poushneh and Vasquez-Parraga, 2017). It is important to note that our study is not about the risk of using a new technology (see for example Roy et al., 2017) but about the risk of making an online purchase.

In addition, we integrate the concept of attractiveness toward alternative online stores (Chuah et al., 2017; Yim et al., 2007). This goes beyond the current focus on purchasing and patronage intention and aims at capturing the potential effect of AR on online store image and assessing the long term advantage provided by AR to online stores.

Finally, we introduce the role of familiarity with AR. The goal of accounting for the influence of familiarity is to assess the potential of AR to provide a competitive advantage in the long run. If the effects of AR decrease or disappear after consumers have become familiar with it, then we can assume that AR will be a “hype” phenomenon. Another objective is to integrate familiarity in the conceptual model of the influence of AR, because this variable has been understudied despite its potential importance.

We first present the research background and hypotheses concerning the integration of attractiveness toward alternative online stores, perceived risk and familiarity with AR. The design and results of two online experiments are then

presented. Study 1 demonstrates the mediating role of perceived risk and attractiveness in the influence of AR on patronage intention. Study 2 confirms these results and extends them by showing that the more people are familiar with AR, the more a decrease in perceived risk increases attractiveness and patronage intention.

## **2. Conceptual background and hypotheses**

### *2.1. AR and the attractiveness towards alternative online store*

AR embeds a virtual product (e.g. a dress, a piece of furniture) into the real environment of consumers. It also allows consumer to interact with products. These new possibilities offered by AR lead to “service augmentation” (Hilken et al., 2017; Poushneh, 2018).

To account and test the influences of AR on online stores, scholars have drawn from research on shopping experience that showed that two dimensions are of special importance for store evaluation: utilitarian evaluation (i.e. usefulness) and hedonic evaluation (i.e. pleasure) (Babin et al., 1994; Childers et al., 2001; Voss et al., 2003). Research has shown that AR-based service augmentation has a positive influence on both utilitarian and hedonic evaluations of online stores (Beck and Crié, 2018; Hilken et al., 2017; Poushneh and Vasquez-Parraga, 2017; Yim et al., 2017). These evaluations increase patronage intentions

(willingness to visit the online store) and purchase intentions (willingness to buy a product from the online store) (Beck and Crié, 2018; Hilken et al., 2017; Poushneh and Vasquez-Parraga, 2017; Yim et al., 2017). Put shortly, AR has an indirect positive influence on patronage or purchase intention via an increase in utilitarian and hedonic attitude toward online stores.

But the question of the impact of AR on store image remains open. Answering this question is important because technological innovation has a positive influence on store image (Beuckels and Hudders, 2016; Fuentes-Blasco et al., 2017; Gil-Saura et al., 2017), because retailers use AR as a mean to be perceived as superior to competitors and gain attractiveness (Bansal et al., 2005), and because store equity, of which attractiveness is a facet, is an antecedent to shopping behavior (Arnett et al., 2003; Gil-Saura et al., 2016; Goedertier et al., 2015; Lee et al., 2009).

The dominant approach to attractiveness has been “alternative attractiveness” defined as “the positive characteristics of competing service providers” (Bansal et al., 2005, p.100). As our focus is the impact of using AR for an online store and as AR has not been widely adopted, we use the mirror concept of attractiveness of the online store (as opposed to alternative attractiveness). We define it as the perceived superiority of an option against other competing options. The focus is then on the evaluation of the online store itself rather than on the



evaluation of its competitors. It is better suited to capture the influence of AR for the online store, as AR is expected to induce a difference toward the majority of online stores that haven't adopted it yet.

Alternative attractiveness has a negative influence on satisfaction (Yim et al., 2007), on loyalty and on the satisfaction-loyalty link (Chuah et al., 2017) and increases consumers intention to switch to other service providers (Bansal et al., 2005). So, in line with these results, we can assume that online store attractiveness will have a positive influence on patronage intention.

Several studies have shown that the implementation of a technology influences the perception of the store, offline (Fuentes-Blasco et al., 2017; Gil-Saura et al., 2017) or online (Beuckels and Hudders, 2016). But, as mentioned before, AR has a positive influence on hedonic and utilitarian evaluations. And these evaluations have a positive influence on store perceptions (Lee et al., 2009; Overby and Lee, 2006). We can infer from this that AR has an indirect positive influence on online store attractiveness via utilitarian and hedonic evaluations.

In sum, we can hypothesize a process of serial mediation from AR to patronage intention (for the sake of simplification, each hypotheses is followed by a simplified representation of the

path between the independent variable and the final dependent variable; =>+ means positive influence; =>- means negative influence):

**H1a.** AR has an indirect positive influence on patronage intention via online store utilitarian evaluation and online store attractiveness (double mediation). (AR=> + Utilitarian evaluation =>+ attractiveness =>+ patronage intention)

**H1b.** AR has an indirect positive influence on patronage intention via online store hedonic evaluation and online store attractiveness (double mediation). (AR=> + Hedonic evaluation =>+ attractiveness =>+ patronage intention)

## *2.2.AR and perceived risk of making a purchase on an online store*

Perceived risk is usually defined as the “consumer’s perceptions of uncertainty and adverse consequences of buying a product (or service)” (Dowling and Staelin, 1994, p.119) or “the subjective expectation of a loss” (Nepomuceno et al., 2014). In other words, perceived risk is the expectation of a loss, and the consequences of such a loss if it occurs. A substantive amount of research has been dedicated to the topic. But it is still an important avenue of research (Pappas, 2016). Understanding elements that can decrease perceived risk is especially crucial (Beck and Crié, 2018; Cheng et al., 2008).

Four facets of perceived risk are usually distinguished: psychosocial risk (harm to identity or self-esteem), financial risk (loss of money), time risk (loss of time because of late delivery for example) and product or performance risk (when expectations about the product are not met when it is used) (Aghekyan-Simonian et al., 2012; Casidy and Wymer, 2016; Nepomuceno et al., 2014). Among these, product risk is the one with the most important and stable impact on shopper behavior (Aghekyan-Simonian et al., 2012; Mohd Suki and Mohd Suki, 2017; Nepomuceno et al., 2014).

To diminish perceived risk, online retailers can use cues, be they extrinsic (not directly related to the website design, assortment or service) or intrinsic (related to or part of the offering) (Cheng et al., 2008). Research has shown that extrinsic cues (e.g. service quality, brand equity, quality guarantees, brand and online images) decrease perceived product risk (Aghekyan-Simonian et al., 2012; Cheng et al., 2008). But, the impact of extrinsic cues seems to be lesser for online stores than for physical stores (Aghekyan-Simonian et al., 2012). It is thus important for online stores to find other means to decrease perceived risk (Cheng et al., 2008).

Among intrinsic cues, AR is an interesting option. Indeed, one of the main causes of perceived product risk in online shopping is that consumers cannot actually interact physically with the product during the shopping trip (touch it, try it on). The

intangibility of products presented online entails difficulties in the evaluation of features of the product (Aghekyan-Simonian et al., 2012; Beck and Crié, 2018; Kim and Forsythe, 2009; Nepomuceno et al., 2014). This results in an uncertainty about the choice, and an increase in perceived risk (Cheng et al., 2008; Nepomuceno et al., 2014). AR can help consumers get a better sense of product features, and thus reduce the risk of making a mistake when purchasing the product (Beck and Crié, 2018; Kim and Forsythe, 2009).

Perceived risk has a negative influence on perceptions, like attitudes (Mohd Suki and Mohd Suki, 2017), trust (Pappas, 2016) or brand evaluations (Baek and Whitehill King, 2015; Goedertier et al., 2015). It also has a strong negative influence on patronage intention (Aghekyan-Simonian et al., 2012; Nepomuceno et al., 2014). Moreover, perceived risk mediates the influence of external cues on purchase intention (Aghekyan-Simonian et al., 2012). Finally, the influence of perceived risk on purchase intention is mediated by perceptions (Goedertier et al., 2015).

Given the results of previous research, we can hypothesize a process of serial mediation from AR to patronage intention:

**H2.** AR has an indirect positive influence on patronage intention via perceived product risk and the attractiveness of

the online store (double mediation). (AR=> - Perceived risk  
=>- attractiveness =>+ patronage intention)

### *2.3.The moderating role of familiarity with AR on the influence of AR on patronage intention*

Familiarity is defined as “the number of product related experiences that have been accumulated by the consumer” (Alba and Hutchinson, 1987, p.411). With experience, consumers develop a set of knowledge about the product or service and know what to expect from a specific product or service. Several studies have shown that familiarity has a moderating influence on the relationships between product or service perceptions and consumer responses. But these studies have not investigated the influence of familiarity with AR. And more generally these studies have focused on the familiarity with a product and the evaluations of this product, and not familiarity with a technology on the impact of this technology.

The moderating role of familiarity on the indirect effect of AR on patronage intention is justified by several reasons.

First, at a general level and concerning evaluations of the online store, consumers with more experience of a product or service tend to perceived it as less novel and typical, which in turns decreases their evaluations of the product (Murray et al.,

2017; Yim et al., 2017; Babin and Babin, 2001; Ainsworth and Foster, 2017). So we can infer that people more familiar with AR will show a weaker relationship between AR and hedonic and utilitarian evaluation.

On the contrary, concerning risk, when consumers have already had previous experiences with a product, they anticipate the potential results of the use of a product and feel less uncertainty. People new to AR may not trust AR ability to help them in evaluating the product, whereas people who already have used AR, as they have had an experience before, may trust more AR to help them to make a purchase with less risk. In this case, people more familiar with AR will show a stronger relationship between AR and perceived risk.

Concerning attractiveness and patronage intention, Nel and Boshoff (2019) have shown that when internet experience is high, the influence of hedonic attitude on purchase intention of mobile-service decreases (Nel and Boshoff, 2019). So we can assume that people more familiar with AR will see a weaker influence of hedonic evaluation on attractiveness. On the contrary, utilitarian evaluation and perceived risk being less linked to emotion will benefit of previous experiences with AR. People more familiar with AR will show a stronger link between utilitarian evaluation and attractiveness on the one hand and between product perceived risk and attractiveness on the other hand.

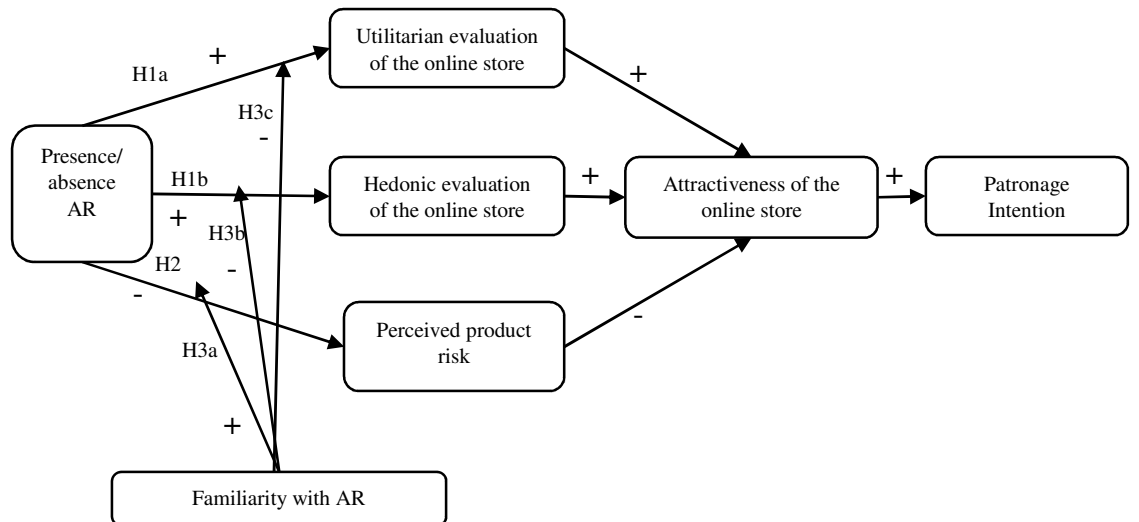
In sum, our hypotheses are:

H3.a. Familiarity with AR moderates the indirect relationship between AR and patronage intention via utilitarian evaluation and attractiveness: people more familiar with AR will show a weaker positive influence of AR on patronage intention via utilitarian evaluation and patronage intention.

H3.b. Familiarity with AR moderates the indirect relationship between AR and patronage intention via hedonic evaluation and attractiveness: people more familiar with AR will show a weaker positive influence of AR on patronage intention via hedonic evaluation and patronage intention.

H.3.c. Familiarity with AR moderates the indirect relationship between AR and patronage intention via perceived risk and attractiveness: people more familiar with AR will show a weaker positive influence of AR on patronage intention via perceived risk and patronage intention.

The research model is summarized in figure 1.



**Fig. 1.** Research model.

### 3. Study 1

The goal of study 1 was to assess the mediating roles of perceived risk and attractiveness in the influence of AR on patronage intention.

#### 3.1. Design and procedure

The design of study was similar to the one of other studies on the influence of AR on online stores (e.g. Javornik, 2016; Poushneh and Vasquez-Parraga, 2017).

A web-based between-subject experiment was conducted in France in may 2016. It manipulated the presence of AR on an online webstore. The product category chosen was sunglasses.

In condition 1 (no AR), participants were shown the picture of the online store of a retailer selling glasses (Fig. 2) which was introduced by the following text: “Please watch carefully this



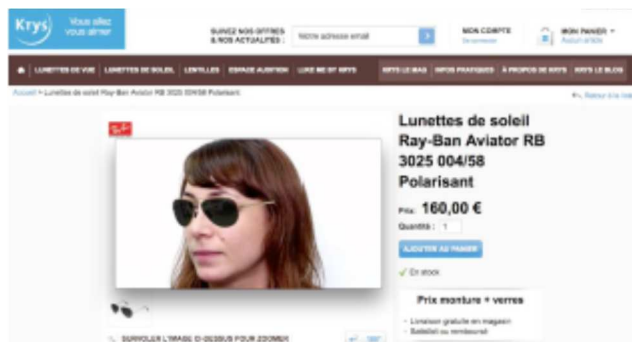
image and take your time imagining yourself in the situation of purchasing sunglasses on this website”.



**Fig. 2.** Image presented in condition 1.

In condition 2 (AR), participants were shown the picture of the same website (Fig 3) but showing a person using AR to try sunglasses on. This was introduced by the following text:

“Please watch carefully this image and take your time imagining yourself in the situation of purchasing sunglasses on this website that proposes a tool that can superimpose sunglasses on the face of the person. Imagine yourself trying the sunglasses on with this tool”.



**Fig 3.** Image presented in condition 2.

98 participants participated in the survey and were randomly assigned to one of the two conditions. We had 53 participants for condition 1, 45 for condition 2. Although there is a difference in size between the two conditions, it is small enough to be acceptable. As to age, participants were rather young: 64.2% were between 18 and 25; 16.3% between 26 and 40; 9.2% between 41 and 50; and 10.2% more than 50. 56% of participants were men and 44% women. There was no difference in gender distribution across conditions ( $p=.761$ ).

### *3.2.Measures*

All concepts of interest to the research objective were measured using existing scales that were adapted to the context of the study.

Hedonic evaluation was measured with 3 items and seven-point semantic differential scales: fun/not fun; thrilling/not thrilling; exciting/not exciting (Voss et al., 2003) (cronbach's alpha=.931 AVE=.883).

Utilitarian evaluation was measured with 3 items and seven-point semantic differential scales: helps me/does not help me; solve my problem/does not solve my problem; beneficial/harmful (Voss et al., 2003) (cronbach's alpha=.782; AVE=.698).

The measure for perceived product risk was adapted from Bart et al. (2005) and Darke et al. (2016). Two items and five-point Likert scales were used (1= Totally disagree; 5= Totally agree): I risk not being satisfied if I bought a product at this online store; I would have confidence in my choice if I bought a product at this online store (cronbach's alpha= .740; AVE=.794). A high score means a low perceived risk.

To measure the attractiveness of the online store, we adapted the "attractiveness of competitors" scale from Bansal et al (2005) to measure the attractiveness of the online store. We used three items and used five-point Likert scale (1= Totally disagree; 5= Totally agree): this website has advantages competitors don't have; this website solves problems competitors don't solve; this website is superior to competitor (cronbach's alpha =.921; AVE=.864).

Finally, patronage intention was measured with one item taken from Bart et al. (2005) and used a five-point Likert scale (1= Totally disagree; 5= Totally agree): I would purchase an item at this online store.

### *3.3. Analysis and results*

To test our hypotheses, we used the PROCESS V 3.3 macro (Hayes, 2018; model 80). Results are summarized in table 1.

Results showed no significant indirect effect of AR on patronage intention via utilitarian evaluation and attractiveness (BootLLCI=-.026; ULCI=.023). H1.a. is then not supported. If AR increases utilitarian evaluation ( $p=.047$ ), this effect is not transferred to attractiveness or to patronage intention, even though utilitarian evaluation has a direct influence on patronage intention ( $p=.01$ ).

H1.b. and H2 are supported.

An online store with AR is evaluated as more fun, and this increases its attractiveness which in turn augments patronage intention (H1.b.;  $\beta = .199$ ; BootLLCI=.010; ULCI=.401). The effect is rather strong. It should be noted that the indirect effect via hedonic evaluation and patronage intention (without the mediation of attractiveness) is not significant.

The presence of AR on an online store also decreases the perceived risk of making a purchase at this online store, which increases attractiveness and in turn patronage intention (H2.;  $\beta = .046$ ; BootLLCI=.000; ULCI=.114). It should be noted first that the effect is low compared to the effect of hedonic evaluation. It should also be noted that the presence of AR has an effect of patronage intention via perceived risk without the mediation of attractiveness ( $\beta = .237$ ; BootLLCI= .060; BootULCI=.436). In this case the effect is stronger.

The results of study 1 confirm the important role of perceived risk in the understanding of the mechanisms of influence of AR on online store. Attractiveness is important mostly to account for the effect of hedonic evaluation.

Hypotheses	Result
H1.a. (rejected)	<p>Indirect effect</p> <p>AR=&gt;Utilitarian evaluation=&gt;Attractiveness =&gt;Patronage intention (BootLLCI=-.026; ULCI=.023)</p> <p>Relevant results concerning direct effect(s)</p> <p>AR=&gt;Utilitarian evaluation: NS (<math>M_{no\_AR}=3.901</math>; <math>M_{AR}=4.423</math>; <math>R^2=.040</math>; <math>F=4.037</math>; <math>p=.047</math>)</p> <p>AR=&gt;Utilitarian evaluation=&gt;Patronage intention: NS (BootLLCI=-.001; ULCI=.235)</p> <p>Utilitarian evaluation=&gt; Attractiveness: NS (<math>p=.941</math>)</p> <p>Utilitarian evaluation=&gt;Patronage intention (<math>R^2=.566</math>; <math>F=23.996</math>; <math>p=.01</math>)</p>
H1.b. (validated)	<p>Indirect effect</p> <p>AR=&gt;Hedonic evaluation=&gt;Attractiveness =&gt;Patronage intention (<math>\beta =.199</math>; BootLLCI=.010; ULCI=.401)</p> <p>Relevant results concerning direct effect(s)</p> <p>AR=&gt;Hedonic evaluation (<math>M_{no\_AR}=2.629</math>; <math>M_{AR}=4.689</math>; <math>R^2=.426</math>; <math>F=71.260</math>; <math>p=.000</math>)</p> <p>AR=&gt;Hedonic evaluation=&gt;Patronage intention (BootLLCI=-.112; BootULCI=.589)</p> <p>Hedonic evaluation =&gt; attractiveness (<math>R^2=.660</math>; <math>F=45.138</math>; <math>p=.000</math>)</p> <p>Attractiveness=&gt;Patronage intention (<math>R^2=.566</math>; <math>F=23.996</math>; <math>p=.038</math>)</p>
H2.(Validated)	<p>AR =&gt;Risk =&gt;Attractiveness =&gt;Patronage intention (<math>\beta =.046</math>; BootLLCI=.000; ULCI=.114)</p> <p>Relevant results concerning direct effect(s)</p> <p>AR=&gt;Perceived product risk (<math>M_{no\_AR}=2.764</math>; <math>M_{AR}=3.287</math>; <math>R^2=.068</math>; <math>F=6.958</math>; <math>p=.010</math>)</p> <p>Perceived product risk =&gt; attractiveness (<math>R^2=.660</math>; <math>F=45.138</math>;</p>

	<p>p=.000)</p> <p>Attractiveness=&gt;Patronage intention (<math>R^2=.566</math>; <math>F=23.996</math>;</p> <p>p=.038)</p> <p>AR=&gt;Risk=&gt;Patronage intention (<math>\beta =.237</math>; BootLLCI= .060;</p> <p>BootULCI=.436)</p>
--	--

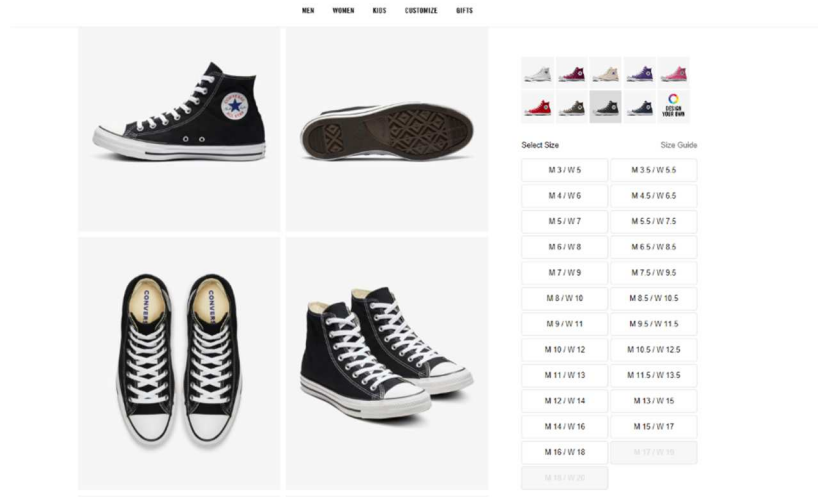
**Table 1.** Summary of results for study 1.

#### 4. Study 2

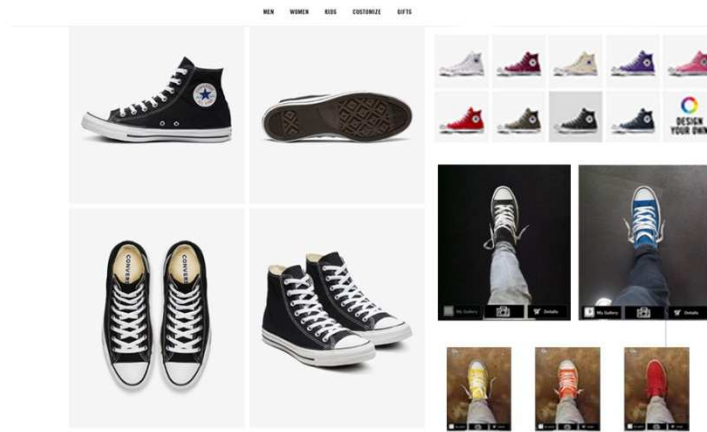
Study 2 aimed to replicate results from study 1 to another product category and to assess the moderating effect of familiarity with AR on patronage intention via utilitarian evaluation, hedonic evaluation, perceived risk and attractiveness of the online store.

##### *4.1.Design and procedure*

A between subject experiment with two conditions was conducted in France in June 2019. Compared to study 1, the only change in design and procedure was the choice of the product category: sneakers. The webstore of the brand “Converse” was chosen. In condition 1 (figure 4), participants were presented the non-AR webstore of the brand. In condition 2 (figure 5), participants were shown an image of the same website to which we added images showing the foot of a person virtually trying sneakers on.



**Figure 4.** Image presented in condition 1 (study 2)



**Figure 5.** Image presented in condition 2 (study 2)

191 participants took part in the survey and were randomly assigned to one of the two conditions. We had 102 participants for condition 1, 89 for condition 2. Again the difference in size is small enough to be acceptable. Mean age of participants was 45, ranging from 18 to 65. 50.3% of participants were men and 49.7% women. There was no difference in gender distribution across conditions ( $p=.713$ ).

#### *4.2. Measures*

Measures were the same as for study 1: hedonic evaluation (cronbach's alpha=.934; AVE=.883), utilitarian evaluation (cronbach's alpha=.898; AVE=.699), perceived product risk (cronbach's alpha=.877; AVE=.794), attractiveness of the online store (cronbach's alpha=.929; AVE=.766) and patronage intention (mono item).

To these measures, we added a measure of familiarity with AR. It was measured with one item measured on a 7-point Likert scale: I have already used AR applications when making purchase on a webstore.

#### *4.3. Results*

To test our hypotheses, we used the PROCESS V 3.3 macro (Hayes, 2018). For the test of H1.a., H1.b. and H2, we used model 80. To account for the moderation of serial mediations (H3.a., H3.b. and H3.C.), we customized model 80. In this case, Wmatrix was: 1,1,0,1,0,0,1,0,0,0,1,0,0,0,0. Results are summarized in table 2.a. (indirect effects) and 2.b. (moderation of the indirect effects).



H1.a. was not supported (BootLLCI = -.005 Boot ULCI = .030).

The presence of AR did not increase patronage intention via utilitarian evaluation and attractiveness. Actually, the presence of AR did not even increase utilitarian evaluation ( $p = .364$ ).

This result is in contradiction with the results of study 1 of the few previous research on the impact of AR (e.g. Hilken et al., 2017; Pantano et al., 2017; Poushneh and Vasquez-Parraga, 2017).

On the contrary, H1.b. was validated ( $\beta = .062$ ; BootLLCI = .001 Boot ULCI = .150). As in study 1 and in echo to previous research, the presence of AR improves hedonic evaluation of the online store, which increases attractiveness and, in turn patronage intention. And, as in study 1, there was no indirect relationship between AR and patronage intention via hedonic evaluation without the mediation of attractiveness (BootLLCI = -.126 ULCI = .115). The influence of AR via hedonic evaluation is realized mostly via the fact that people perceive the online store as being different. Without this perception of difference, the influence of AR via hedonic evaluation on patronage intention seems to disappear. It should be noted that the effect is lower than for study 1.

H2. was also supported ( $\beta = .034$ ; BootLLCI = .000 Boot ULCI = .087). As in study 1, AR decreases perceived risk, which improves attractiveness of the store and then patronage intention. As in study 1 too, the decrease in perceived risk

induced by the presence of AR directly increases patronage intention, without the mediation of attractiveness ( $\beta = .193$ ; BootLLCI=.051 Boot ULCI= .364). Again the effect is stronger than in the case of double mediation.

In sum, study 2 confirms the result of study 1 with the exception of utilitarian evaluation.

If we turn to familiarity with AR, the moderating role of this variable is confirmed in the case of perceived risk only.

H3.a. (moderation of the indirect effect of AR on patronage intention via utilitarian evaluation and attractiveness) is rejected. Whatever the level of familiarity with AR, the serial mediation is not significant (Familiarity = 1: BootLLCI=-.015 BootULCI=.034; Familiarity = 3: BootLLCI=-.006 BootULCI=0.27; Familiarity = 5 BootLLCI=-.010 BootULCI=.032).

H3.b. (moderation of the indirect effect of AR on patronage intention via utilitarian evaluation and attractiveness) is also rejected. The serial mediation is not significant for lower level of familiarity (Familiarity = 1: BootLLCI=-.005 ULCI=.165) and higher level of familiarity (Familiarity = 5: BootLLCI=-.004 BootULCI=.154). But it is significant for moderate level of familiarity (Familiarity = 3: BootLLCI=.003 BootULCI=.154). There seems to be a relationship, but not in the direction expected.

On the contrary, H3.c. (moderation of the indirect effect of AR on patronage intention via perceived risk and attractiveness) is validated. The serial mediation is not significant for lower level of familiarity (Familiarity =1: BootLLCI=-.016 BootULCI=.092). It becomes significant for moderate level of familiarity (Familiarity = 3: BootLLCI=.001 BootULCI=.088) and for higher level of familiarity (Familiarity=5: BootLLCI=.000 BootULCI=.114). Moreover, the effect is stronger for higher level of familiarity (.047) than for moderate level of familiarity (.036). In sum, the more people are familiar with AR, the stronger the effect of AR on patronage intention via perceived risk and attractiveness.

Another interesting result is that familiarity moderates the influence of AR on patronage intention via product perceived risk (without the mediation of attractiveness). Familiarity doesn't moderate the indirect relationship when it is low (Familiarity=1: BootLLCI=-.092 BootULCI=.401). But it does for moderate level of familiarity (Familiarity=3: BootLLCI=.046 BootULCI=.360) and for higher level of familiarity (Familiarity=5: BootLLCI=.043 BootULCI=.470). The effect is stronger for higher level of familiarity (.244) than for moderate level of familiarity (.191).

Hypotheses	Result
H1.a. (rejected)	Indirect effect AR=>Utilitarian

	<p>evaluation=&gt;Attractiveness =&gt;Patronage intention (BootLLCI=-.005 Boot ULCI=.030)</p> <p>Relevant results concerning direct effect(s)</p> <p>AR=&gt;Utilitarian evaluation: NS (p=.364)</p> <p>Utilitarian evaluation=&gt; Attractiveness: NS (p=.941)</p>
H1.b. (validated)	<p>Indirect effect</p> <p>AR=&gt;Hedonic evaluation=&gt;Attractiveness =&gt;Patronage intention (<math>\beta</math> = .062; BootLLCI = .001 Boot ULCI = .150)</p> <p>Relevant results concerning direct effect(s)</p> <p>AR=&gt;Hedonic evaluation (<math>M_{no\_AR}</math>=4.08; <math>M_{AR}</math>=4.779; <math>R^2</math>=.048 <math>F</math>=9.552; <math>p</math>=.002)</p> <p>Hedonic evaluation =&gt; attractiveness (<math>R^2</math>=.656; <math>F</math>=88.184; <math>p</math>=.000)</p> <p>Attractiveness=&gt;Patronage intention (<math>R^2</math>=.595; <math>F</math>=54.376; <math>p</math>=.000)</p>
H2.(Validated)	<p>AR =&gt;Risk =&gt;Attractiveness =&gt;Patronage intention (<math>\beta</math> = .034; BootLLCI=.000 Boot ULCI=.087)</p> <p>Relevant results concerning direct effect(s)</p> <p>AR=&gt;Perceived product risk (<math>M_{no\_AR}</math>=2.088; <math>M_{AR}</math>=2.449; <math>R^2</math>=.037; <math>F</math>=7.292; <math>p</math>=.008)</p> <p>Perceived product risk =&gt; attractiveness (<math>R^2</math>=.656; <math>F</math>=88.184; <math>p</math>=.000)</p> <p>Attractiveness=&gt;Patronage intention (<math>R^2</math>=.595; <math>F</math>=54.376; <math>p</math>=.000)</p> <p>AR=&gt;Risk=&gt;Patronage intention (<math>\beta</math> =.237; BootLLCI= .060; BootULCI=.436)</p>

**Table 2.a.** Summary of results for study 2 (indirect effects).

H3.a. (Rejected)	<p>Moderation of AR=&gt;Utilitarian evaluation=&gt;Attractiveness =&gt;Patronage intention</p>
------------------	--

	<p>Familiarity = 1: BootLLCI=-.015  BootULCI=.034; <math>\beta</math> =.002</p> <p>Familiarity = 3: BootLLCI=-.006  BootULCI=.027; <math>\beta</math> =.003</p> <p>Familiarity = 5: BootLLCI=-.010  BootULCI=.032; <math>\beta</math> =.004</p>
H3.b. (Rejected)	<p>Moderation of AR=&gt;Hedonic  evaluation=&gt;Attractiveness =&gt;Patronage  intention</p> <p>Familiarity = 1: BootLLCI=-.005  ULCI=.165; <math>\beta</math> =.061</p> <p>Familiarity = 3: BootLLCI=.003  BootULCI=.154; <math>\beta</math> =.061</p> <p>Familiarity = 5: BootLLCI=-.004  BootULCI=.154; <math>\beta</math> =.061</p>
H3.c. (accepted)	<p>Moderation of AR=&gt;Perceived  risk=&gt;Attractiveness =&gt;Patronage intention</p> <p>Familiarity =1: BootLLCI=-.016  BootULCI=.092; <math>\beta</math> =.026</p> <p>Familiarity = 3: BootLLCI=.001  BootULCI=.088; <math>\beta</math> =.036</p> <p>Familiarity=5: BootLLCI=.000  BootULCI=.114); <math>\beta</math> =.047</p>
Supplementary analysis concerning the moderation of the indirect effect of AR on purchase intention via perceived risk (simple mediation)	<p>Moderation of AR=&gt;Risk=&gt;Patronage  intention</p> <p>Familiarity =1: BootLLCI=-.092  BootULCI=.401; <math>\beta</math> =.138.</p> <p>Familiarity = 3: BootLLCI=.046  BootULCI=.360; <math>\beta</math> =.191</p> <p>Familiarity=5: BootLLCI=.043  BootULCI=.470); <math>\beta</math> =.244</p>

**Table 2.b.** Summary of results for study 2 (moderation of indirect effects).

## 5. Contributions

Before turning to the contributions of the research, one main limitation must be highlighted. The experiment we designed was not based on the actual use of the technology. This of course may affect the results, even though this methodology has been used substantially in AR research (e.g. Poushneh and Vasquez-Parraga, 2017) and has been confirmed as robust in an area of research where “real immersion” may be supposed to be more relevant: research on store design (Roschk et al., 2016). Moreover, concerning hedonic and utilitarian variables, results are in line with the results from studies based on real use of AR (at least for study 1 concerning utilitarian evaluation, an interpretation of the absence of effect of utilitarian evaluation in study 2 is given below). Finally, part of our goal, was to assess the “communication” and “novelty” effect of AR. Given these objectives, the use of a presentation of a technology is relevant. Of course, more research is needed to confirm and nuance our results when people use AR, and especially to assess the influence of AR features (e.g. environmental embedding, simulated physical control, interactivity,...) on risk.

If we turn to contributions, probably the most significant result of the two experiments lies in the role of perceived risk in accounting for the influence of AR for online store. It mediates the influence of AR on patronage indirectly via the mediating role of attractiveness, but mostly directly. Moreover, these

effects are reinforced when people become more familiar with AR. This is an important result as it shows that AR, if it is designed to address the issue of the uncertainties people have when they buy a product online, can survive the “newness” effect of AR. These results contribute to the literature on perceived risk in online retail settings, and answer the calls from Cheng et al. (2008) about the necessity to identify means to reduce perceived risk of online purchase and from Beck and Crié (2018) about the need to account for perceived risk in the study of the influence of AR.

The role of attractiveness has also been demonstrated but it is closely link to hedonic evaluation. Attractiveness does not mediate the indirect relationship between AR and patronage intention via utilitarian evaluation. It does for perceived risk, but this link is weak. And the influence of AR via perceived risk on patronage intention can be direct, with a strong effect. But for hedonic evaluation the effect is only through attractiveness. This is also an important result because the hedonic influence of AR on patronage intention is dependent of the fact that the online store is perceived as different. Once the development of AR becomes more massive, this effect may disappear and not survive the “hype” effect. This is sustained by another result. Only for people moderately familiar with AR is this result significant. For people who don’t know AR or who are familiar with AR, the hedonic route of the influence of

AR on patronage intention via attractiveness is not significant.

This contributes to research on the impact of AR on online settings and, more generally, on the impact of technology in retail, where hedonic experience is of key importance. We show here that the direct link between hedonic evaluation and patronage intention is due to a “being different” effect. This should be taken into account when studying the impact of technology. In this line of reasoning, the integration of the role of familiarity with AR, or more generally with the technology studied, seems important. Different shapes of relationships can emerge when familiarity with technology is studied, especially really new technology.

A last but more surprising result is the fact that utilitarian has a low effect (study 1) or has no effect (study 2). The result of study 2 may be connected to the product category. Sneakers and the brand “Converse” may be a product category where the utility of AR is less evident. This is a relatively well known product where the added value of AR may be less evident.

Even the use of a mirror in a store may be less important for sneakers than for sunglasses. Nevertheless, it pleads for further investigations on the possibility to generalize these results and the ones of previous research to different product categories.

## **6. Conclusion and managerial implications**



This research has demonstrated with two experiments the role of perceived risk in the influence of AR for online stores, the importance of accounting for familiarity with AR and attractiveness, especially concerning hedonic evaluation.

We see two main managerial implications to our research. They both deal with the relevance of the use of AR by online retailers.

Firstly, the role of hedonic evaluation, and the impact on attractiveness, shows that online retailers will benefit from using AR, and probably technology more generally, as part of their communication strategy. An online store just showing the possibility to use new technologies will probably be perceived as different from competitors, as long as the technology has not been widely adopted. But it also means that this “hype” benefit may be short lived. Once people become more familiar with the technology and more online store use it, the hedonic effect of the presence of the technology may disappear. This means that online store needs to make the technology even more fun or different.

An alternative strategy is to focus on the long term benefits AR can provide to online store visitors: making them more confident with their choice of a product online. This may lead to other design developments of AR applications: more simple, more realistic, maybe less fun but more efficient applications.

## References

- Aghekyan-Simonian, M., Forsythe, S., Suk Kwon, W.,  
Chattaraman, V., 2012. The role of product brand image  
and online store image on perceived risks and online  
purchase intentions for apparel. *J. Retail. Consum. Serv.*  
19, 325–331.  
<https://doi.org/10.1016/j.jretconser.2012.03.006>
- Ainsworth, J., Foster, J., 2017. Comfort in brick and mortar  
shopping experiences: Examining antecedents and  
consequences of comfortable retail experiences. *J. Retail.  
Consum. Serv.* 35, 27–35.  
<https://doi.org/10.1016/j.jretconser.2016.11.005>
- Alba, J.W., Hutchinson, J.W., 1987. Dimensions of Consumer  
Expertise. *J. Consum. Res.* 13, 411.  
<https://doi.org/10.1086/209080>
- Arnett, D.B., Laverie, D.A., Meiers, A., 2003. Developing  
parsimonious retailer equity indexes using partial least  
squares analysis: A method and applications. *J. Retail.* 79,  
161–170. [https://doi.org/10.1016/S0022-4359\(03\)00036-8](https://doi.org/10.1016/S0022-4359(03)00036-8)
- Babin, B.J., Babin, L., 2001. Seeking something different? A  
model of schema typicality, consumer affect, purchase  
intentions and perceived shopping value. *J. Bus. Res.* 54,  
89–96. [https://doi.org/10.1016/S0148-2963\(99\)00095-8](https://doi.org/10.1016/S0148-2963(99)00095-8)

- Babin, B.J., Darden, W.R., Griffin, M., 1994. Work and Fun :  
Measuring Hedonic and Utilitarian Shopping Value. *J. Consum. Res.* 20, 644–657.
- Baek, T.H., Whitehill King, K., 2015. When comparative valence frame affects brand extension evaluations: the moderating role of parent-extension fit. *Int. J. Advert.* 34, 382–401. <https://doi.org/10.1080/02650487.2014.996196>
- Bansal, H.S., Taylor, S.F., James, Y.S., 2005. " Migrating " to New Service Providers : Toward a Unifying Framework of Consumer ... *J. Acad. Mark. Sci.* 33, 96-115.  
<https://doi.org/10.1177/0092070304267928>
- Bart, Y., Shankar, V., Sultan, F., Urban, G.L., 2005. Are the Drivers and Role of Online Trust the Same for All Web Sites and Consumers?: A Large-Scale Exploratory Empirical Study. *J. Mark.* 69, 133–152.  
<https://doi.org/10.2139/ssrn.380404>
- 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. *J. Retail. Consum. Serv.* 40, 279–286.  
<https://doi.org/10.1016/j.jretconser.2016.08.006>
- Beuckels, E., Hudders, L., 2016. An experimental study to investigate the impact of image interactivity on the

perception of luxury in an online shopping context. *J.*

*Retail. Consum. Serv.* 33, 135–142.

<https://doi.org/10.1016/j.jretconser.2016.08.014>

Casidy, R., Wymer, W., 2016. A risk worth taking: Perceived risk as moderator of satisfaction, loyalty, and willingness-to-pay premium price. *J. Retail. Consum. Serv.* 32, 189–197. <https://doi.org/10.1016/j.jretconser.2016.06.014>

Chaney, D., Lunardo, R., Bressolles, G., 2016. Making the store a place of learning: The effects of in-store educational activities on retailer legitimacy and shopping intentions. *J. Bus. Res.* 69, 5886–5893.

<https://doi.org/10.1016/j.jbusres.2016.04.104>

Cheng, J.M.S., Wang, E.S.T., Lin, J.Y.C., Chen, L.S.L., Huang, W.H., 2008. Do extrinsic cues affect purchase risk at international e-tailers: The mediating effect of perceived e-tailer service quality. *J. Retail. Consum. Serv.* 15, 420–428. <https://doi.org/10.1016/j.jretconser.2007.11.001>

Childers, T.L., Carr, C.L., Peck, J., Carson, S., 2001. Hedonic and utilitarian motivations for online retail shopping behavior. *J. Retail.* 77, 511–535.

Chuah, S.H.W., Marimuthu, M., Kandampully, J., Bilgihan, A., 2017. What drives Gen Y loyalty? Understanding the mediated moderating roles of switching costs and alternative attractiveness in the value-satisfaction-loyalty

chain. *J. Retail. Consum. Serv.* 36, 124–136.

<https://doi.org/10.1016/j.jretconser.2017.01.010>

Dacko, S.G., 2017. Enabling smart retail settings via mobile augmented reality shopping apps. *Technol. Forecast. Soc. Change* 124, 243–256.

<https://doi.org/10.1016/j.techfore.2016.09.032>

Darke, P.R., Brady, M.K., Benedicktus, R.L., Wilson, A.E., 2016. Feeling Close From Afar: The Role of Psychological Distance in Offsetting Distrust in Unfamiliar Online Retailers. *J. Retail.* 92, 287–299.

<https://doi.org/10.1016/j.jretai.2016.02.001>

Dowling, G.R., Staelin, R., 1994. A Model of Perceived Risk and Intended Risk-Handling Activity. *J. Consum. Res.* 21, 119–134. <https://doi.org/10.1086/209386>

Fuentes-Blasco, M., Moliner-Velázquez, B., Servera-Francés, D., Gil-Saura, I., 2017. Role of marketing and technological innovation on store equity, satisfaction and word-of-mouth in retailing. *J. Prod. Brand Manag.* 26, 650–666. <https://doi.org/10.1108/JPBM-07-2016-1279>

Gil-Saura, I., Molina, M.E.R., Berenguer-Contrí, G., 2016. Store equity and behavioral intentions: The moderating role of the retailer's technology. *J. Prod. Brand Manag.* 25, 642–650. <https://doi.org/10.1108/JPBM-11-2015-1035>

Gil-Saura, I., Šerić, M., Ruiz-Molina, M.E., Berenguer-Contrí,

G., 2017. The causal relationship between store equity and loyalty: Testing two alternative models in retailing. *J. Brand Manag.* 24, 193–208.  
<https://doi.org/10.1057/s41262-016-0024-2>

Goedertier, F., Dawar, N., Geuens, M., Weijters, B., 2015. Brand typicality and distant novel extension acceptance: How risk-reduction counters low category fit. *J. Bus. Res.* 68, 157–165. <https://doi.org/10.1016/j.jbusres.2014.04.005>

Hayes, A.F., 2018. *Introduction to Mediation, Moderation, and Conditional Process Analysis*. The Guilford Press, New-York.

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. *J. Acad. Mark. Sci.* 45, 884–905. <https://doi.org/10.1007/s11747-017-0541-x>

Javornik, A., 2016. ‘It’s an illusion, but it looks real!’ Consumer affective, cognitive and behavioural responses to augmented reality applications. *J. Mark. Manag.* 32, 987–1011.  
<https://doi.org/10.1080/0267257X.2016.1174726>

Kim, J., Forsythe, S., 2009. Adoption of sensory enabling technology for online apparel shopping. *Eur. J. Mark.* 43, 1101–1120. <https://doi.org/10.1108/03090560910976384>

- Kim, J., Forsythe, S., 2008. Adoption of virtual try-on technology for online apparel shopping. *J. Interact. Mark.* 22, 45–60. <https://doi.org/10.1002/dir>
- Lee, M.Y., Kim, Y.K., Fairhurst, A., 2009. Shopping value in online auctions: Their antecedents and outcomes. *J. Retail. Consum. Serv.* 16, 75–82. <https://doi.org/10.1016/j.jretconser.2008.11.003>
- Milgram, P., Kishino, F., 1994. A Taxonomy of Mixed Reality Visual Displays. *IEICE Trans. Inf. Syst.* E77D, 1321–1329.
- Mohd Suki, Norazah, Mohd Suki, Norbayah, 2017. Modeling the determinants of consumers' attitudes toward online group buying: Do risks and trusts matters? *J. Retail. Consum. Serv.* 36, 180–188. <https://doi.org/10.1016/j.jretconser.2017.02.002>
- Murray, J., Elms, J., Teller, C., 2017. Examining the role of store design on consumers' cross-sectional perceptions of retail brand loyalty. *J. Retail. Consum. Serv.* 38, 147–156. <https://doi.org/10.1016/j.jretconser.2017.06.001>
- Nel, J., Boshoff, C., 2019. Online customers' habit-inertia nexus as a conditional effect of mobile-service experience: A moderated-mediation and moderated serial-mediation investigation of mobile-service use resistance. *J. Retail. Consum. Serv.* 47, 282–292.

<https://doi.org/10.1016/j.jretconser.2018.12.003>

Nepomuceno, M.V., Laroche, M., Richard, M.O., 2014. How to reduce perceived risk when buying online: The interactions between intangibility, product knowledge, brand familiarity, privacy and security concerns. *J. Retail. Consum. Serv.* 21, 619–629.

<https://doi.org/10.1016/j.jretconser.2013.11.006>

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. *Pers. Ubiquitous Comput.* 17, 287–304.

<https://doi.org/10.1007/s00779-011-0494-x>

Overby, J.W., Lee, E.J., 2006. The effects of utilitarian and hedonic online shopping value on consumer preference and intentions. *J. Bus. Res.* 59, 1160–1166.

<https://doi.org/10.1016/j.jbusres.2006.03.008>

Pantano, E., Rese, A., Baier, D., 2017. Enhancing the online decision-making process by using augmented reality: A two country comparison of youth markets. *J. Retail. Consum. Serv.* 38, 81–95.

<https://doi.org/10.1016/j.jretconser.2017.05.011>

Pappas, N., 2016. Marketing strategies, perceived risks, and consumer trust in online buying behaviour. *J. Retail. Consum. Serv.* 29, 92–103.



<https://doi.org/10.1016/j.jretconser.2015.11.007>

Poushneh, A., 2018. Augmented reality in retail: A trade-off between user's control of access to personal information and augmentation quality. *J. Retail. Consum. Serv.* 41, 169–176. <https://doi.org/10.1016/j.jretconser.2017.12.010>

Poushneh, A., Vasquez-Parraga, A.Z., 2017. Discernible impact of augmented reality on retail customer's experience, satisfaction and willingness to buy. *J. Retail. Consum. Serv.* 34, 229–234. <https://doi.org/10.1016/j.jretconser.2016.10.005>

Roschk, H., Maria, S., Loureiro, C., Breitsohl, J., 2016. Calibrating 30 Years of Experimental Research : A Meta-Analysis of the Atmospheric Effects of Music , Scent , and Color. *J. Retail.* 1–12. <https://doi.org/10.1016/j.jretai.2016.10.001>

Roy, S.K., Balaji, M.S., Sadeque, S., Nguyen, B., Melewar, T.C., 2017. Constituents and consequences of smart customer experience in retailing. *Technol. Forecast. Soc. Change* 124, 257–270. <https://doi.org/10.1016/j.techfore.2016.09.022>

Voss, K.E., Spangenberg, E.R., Grohmann, B., 2003. Measuring the Hedonic and Utilitarian Dimensions of Consumer Attitude. *J. Mark. Res.* 40, 310–320. <https://doi.org/10.1509/jmkr.40.3.310.19238>

Yim, C.K. (Bennett), Chan, K.W., Hung, K., 2007. Multiple reference effects in service evaluations: Roles of alternative attractiveness and self-image congruity. *J. Retail.* 83, 147–157.  
<https://doi.org/10.1016/j.jretai.2006.10.011>

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. *J. Interact. Mark.* 39, 89–103.  
<https://doi.org/10.1016/j.intmar.2017.04.001>