

# The Shopping Experience in Virtual Sales: A Study of the Influence of Website Atmosphere on Purchase Intention



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**Abstract** The conceptual framework for this research comes from the study of environmental psychology in response to a given environment that condition approach-avoidance behaviors. These three states were pleasure (satisfaction/happiness), arousal (stimulation), and dominance (feeling of control), or PAD. Subsequently, further research applied this theory to the context of a retail setting in order to better understand the influence of a physical store's atmosphere on consumers. The main purpose of this study is to analyze the effects of certain marketing tools and the atmosphere created at a Point-Of-Sales (PoS) on the online shopping experience and purchase intention. The methodology for the work is based on the well-known stimulus-organism-response (S-O-R) model, which has been the subject of numerous consumer behavior studies. The approach for this study is an experiment in which a sample of individuals takes part in a double online shopping experience involving two different scenarios with different dimensions and atmospheres. Despite other existing research has demonstrated in the past the impact of vividness' info and video materials on the purchase intention, the originality of this study is the usability of 3D-dimension as a virtual presence enhancer to demonstrate both, better experience and more realistic shopping behavior closer to the findings we can expect from a consumer on the physical traditional stores.

**Keywords** Consumer behavior · Multi-channel retailing · Online buying experience · Internet shopping · Online atmosphere · Virtual presence · E-commerce

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# 1 Introduction

Today, there is growing interest in all aspects of how consumers experience brands [26], as well as in the evolution of the new channels consumers are being offered for their commercial transactions with them [29]. This paper focuses on these new online shopping channels and, specifically, the validity and effectiveness of the elements used to stimulate purchases at physical points of sale (merchandising material, in-store displays (ISDs)) when they are deployed in an online shopping environment [2, 13, 14]. Paradoxically, while the shopping experience in a physical environment always takes place in a three-dimensional space, nearly all online retailers, or “e-tailers,” choose 2D navigation for their online stores, giving rise to starkly different brand images and experiences [20].

The product category chosen for this study is appliances. Within the broader family of electronics and technological equipment, appliances are the category with the lowest share of online sales (8% in Spain in 2015, according to data from the market research consultancy GfK-Emer). This is because, in the large majority of cases, prospective appliance consumers prefer to use online channels to research their purchase decision, but ultimately perform the purchase/transaction at a physical POS, preferably one where the product they have previously picked out is on display. This effect is known as “Ro-Po” (Research Online, Purchase Offline) or “webrooming” [27]. This stands in contrast to other product categories, such as consumer electronics (audio and video), computers (PCs and printers), and mobile devices (tablets and smartphones). With those products, consumers are more willing to perform all stages of the purchasing process (research, comparison, selection, transaction) without leaving the online channel and, in some cases, even choose to purchase the product online after inspecting it in person at a brick-and-mortar outlet, an effect known as “showrooming” [23].

This paper focuses on “webmosphere” and the impact of interactivity in a highly realistic virtual environment designed to enhance the sense of virtual presence. It also analyses how these features enhance the consumer experience in online stores [4, 18]. Although there is extensive literature in this field in Spain, including on how website design variables influence the consumer shopping experience [21], most of it either compares 2D static elements (images) with 2D dynamic images (videos) [11] or compares 2D static designs (images) with 3D static ones (images). The originality of the present study relies on the fact that it compares a 2D static environment with a highly realistic 3D immersive one [1] that allows subjects to interact freely with the environment, thereby fostering their sense of virtual presence or “being there” [15]. In short, it creates a virtual reality effect, which maximizes the sense of realism, emulating a physical shopping environment and the known effects such environments have on consumer behavior [34].

Consequently, the objective of this paper is to demonstrate the more realistic the on-line store is, the better shopping experience the consumer perceives. The methodology to test the hypotheses is an experiment with real consumers engaging with 2 different e-commerce set-ups. The results, as expected, show the consumer

feels better and more confident on a scenario closer to a real look and feel physical store.

The structure of the paper starts with the theoretical foundations based on the traditional off-line consumer behavior and how can be applied on the new on-line consumer when purchasing online. After the introduction, the paper highlights the key targets as well as the hypotheses to be validated throughout the research. The next sections contain the research method with the sample selection and the model variables and the results of the study. Finally, the conclusion section explains the main model contributions, key implications and the research limitations and future research venues.

## 2 Theoretical Foundations

The conceptual framework is grounded in the study of environmental psychology, first introduced by [22], who identified three emotional states in response to a given environment that condition approach-avoidance behaviors. These three states were pleasure (satisfaction/happiness), arousal (stimulation), and dominance (feeling of control), or PAD. Subsequently, [28] applied this theory to the context of a retail setting in order to gain insight into how the stimuli of the atmosphere of a physical store influence consumers [28].

Ever since, the model generally used in these types of studies has been the stimuli-organism-response (S-O-R) model, which has been widely developed in the literature on consumer behavior. There is extensive literature on the S-O-R model in a real atmosphere (physical store), based on the study of various stimuli variables in a store or POS (external, interior, design, decoration, and human) and how they affect buyers and sellers and their corresponding responses or behaviors [34]. Since the rise of e-commerce (beginning in 2001), numerous papers have likewise applied the S-O-R model in the context of online retail settings [12], where the store is no longer a physical space but nevertheless seeks to replicate the shopping experience in a virtual environment [6, 13].

The study of consumer behavior in online environments, in which some of the five senses are limited, is a very challenging field in neuromarketing, which has traditionally focused heavily on environments offering a multisensory experience [19]. Although an alternative model exists for addressing the issue of virtual presence and web atmosphere (i.e., the Technology Acceptance Model or TAM [5], in the authors' view it is more focused on the man-machine interaction from the perspective of learning, usefulness, and the ease of use of new technologies [35]. As the present study is more interested in the experience of users as they browse, the S-O-R model seemed more appropriate. Specifically, the chosen model was the S-O-R model as revised by authors such as [3] in keeping with their concept of "webmospherics," which are determined by three variables: Structural/design attributes, Media dimensions and Site layout/dimensions.

Several non-Spanish authors have researched this topic [6, 17]. A more recent study at Oregon State University [30] applied this model to the visual presentation of products at online retailers, using image size and the number of product views as variables.

### 3 Objectives and Hypotheses

The S-O-R model formerly introduced in the “Theoretical Foundations” section above, is the point of departure for the consumer behavior research we aim to run thought this paper, where we will analyze the impact of specific stimuli influence (WD), under certain control factors (BT and PP), on the consumer perceived shopping experience (EX and NPI) and the purchase intention patronage (PI).

As “Stimuli” variables, 2 different environment scenarios will be selected, Consumers sample participating on this research, will be guided throughout these 2 online shopping frameworks Online 2D and Online 3D (WD).

The “Organism” variables to be analyzed are the Need for Inspection (NPI) and shopping experience Satisfaction (EX) both resulting right after the participation on the research different environments (2D versus 3D)

As “Response” variable the Purchase intention (PI) after shopping experience has been selected and we have also included a tracking record of the 2 control variables: Shopping-Navigation Time spent (BT) and prior product purchase experience (PP) on the research design.

The preliminary hypothesis on the proposed model to be validated throughout the research are:

- Hypothesis 1: A 3D presentation offers an enhanced consumer shopping experience compared to 2D navigation.
- Hypothesis 2: A 3D presentation reduces the need to physically inspect the product.
- Hypothesis 3: A 3D presentation increases the time consumers spend browsing before leaving.
- Hypothesis 4: The more time a consumer spends browsing, the more likely he or she is to purchase the target product (appliance).
- Hypothesis 5: Reducing the need to physically inspect the product increases purchase intention.
- Hypothesis 6: Enhancing the shopping experience increases the intention to purchase the target product (appliance).
- Hypothesis 7: Prior purchase of an appliance on an online channel increases the intention to purchase the target product (washing machine).

Figure 1 shows the initially proposed model with the 7 hypotheses to be tested and how they are positively or negatively related to the analyzed variables (Table 1).

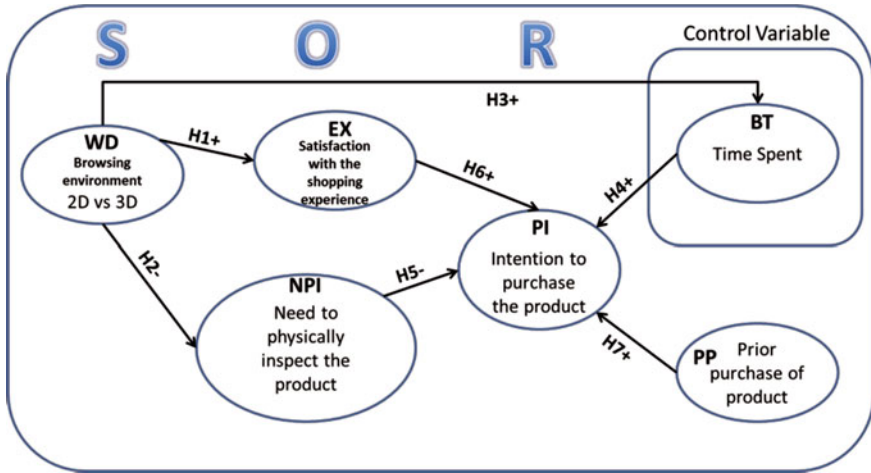


Fig. 1 Proposed model

Table 1 Initial model variables

		Dimensions	
Variables related to the object of study (independent variables)	(WD) Browsing environment dimensions	2D	3D
	(PP) Prior purchase of product	YES	NO
	(BT) Time spent Browsing	Minutes spent browsing	
Variables related to the outcomes (dependent variables)	(EX) Satisfaction with the shopping experience	On a Likert scale (1–5) from “strongly disagree” to “strongly agree”	
	(PI) Intention to purchase the product (washing machine)	On a Likert scale (1–5) from “strongly disagree” to “strongly agree”	
	(NPI) Need to physically inspect the product*	On a Likert scale (1–5) from “strongly disagree” to “strongly agree”	

## 4 Research Method

The experiment's design is largely based on the work of Suh, including his empirical research on the effects of virtual reality on consumer learning [33] and his research on how "telepresence," achieved through the user interface, affects consumer perceptions in online stores [32].

The research method is based on a remote laboratory experiment consisting of the observation of the behavior of the participating consumers, who connect to a terminal from their homes. The experimental technique is based on a user interface equipped with state-of-the-art Artilux VSO virtual reality technology developed by Quasar Labs, making it possible to record all the movements consumers make during their browsing experience in a simulated purchase process.

Two "simulated" online stores were developed, one with a traditional 2D static browsing interface, like most e-commerce websites today, and the other with a 3D virtual reality interface that allows users to move freely through the store, interacting with merchandising and product display elements, just as they would in a physical store. To ensure the symmetry of the information received by the consumer in each browsing experience (2D and 3D), only visual stimuli were included. The inclusion of other stimuli, such as sound in the case of the 3D virtual-reality browsing experience, was ruled out.

The individuals in the sample were subjected to an initial experience in the 2D environment (store). Data were gathered via an ad hoc survey that they were asked to complete upon finishing browsing. They then moved onto the second experience, entering in the 3D environment (store). Upon finishing browsing, they were asked to complete a second ad hoc survey in order to enable the collection of data on the second experience.

The product chosen for the experiment was a household appliance (specifically, washing machines), as appliances are a virtually-high-experiential (VHE) [33] product category, whose most prominent attributes are their external appearance and features, and which can thus be fully represented through visual stimuli ideally suited for an online store environment such as the one proposed here.

The Partial Least Squares (PLS) regression model was chosen to confirm the hypotheses. We used SmartPLS Software to perform this analysis and estimations.

### 4.1 Sample Design

A trial test was conducted with 9 users from academia (researchers) to validate the construction of the pilot stores [33] and verify the natural process of the experiment.

Once the initial trial test of the experiment was complete, a sample of 160 individuals linked to the world of marketing professionals (managers and marketing students) was assembled, and the participants were emailed a link they could use to access the experience with the two online stores (2D and 3D).

Although the experiment was designed to allow participants to browse both stores at will and leave whenever they wished, the data on browsing time were recorded with the control variable BT (time spent browsing) and reasonable minimum and maximum “experience” times were set in order to ensure the validity of the results. To this end, 15 participants were eliminated from the total sample as their browsing times fell outside the established time margin (14–673 s). Thus, the final sample on which the statistical analysis was performed consisted of 145 users.

## 4.2 Statistical Analysis

In order to obtain the final model, we performed the following analysis using a previously published model:

1. We checked the type of relationship (positive or negative) according to the hypothesis established in the original model using a linear or logistic regression analysis.
2. Assessment of the original scheme, measuring the quality by using the statistical model of Partial Least Squares (PLS) allowing the analysis of all the hypotheses as a method for estimating multiple simultaneous correlations between different study variables [9] with a view to validating the consistency of the resulting model. This provided the best fitting model of the parameters studied.

## 5 Results

The final model was obtained upon the study of the adjusted indexes in different situations of the model. As the ordinal variables presented  $\leq 5$  categories, a Diagonally Weighted Least Squares method was used to estimate the values of the model.

We analyzed the following statistical indexes:

- Browne’s ADF Chi-Square: It is considered a goodness-fit test being acceptable when the p value  $> 5\%$ .
- Comparative Fit Index (CFI): It is a goodness-fit test corrected by the degree of freedom and it’s acceptable when the value is between 90% and 95% and good  $> 95\%$ .
- Root Mean Square Error of Approximation (RMSEA): It is a population level adjusted model in which a value  $< 0.08$  confirms the model reliability.

On a second stage we also run an analysis of the reliability measurement index as it is shown below (Table 2).

Regarding the Reliability measurement index the Cronbach Alpha value is higher than  $> 0.5$  for every variable as it is shown on Table 2. On top of that, the composite reliability index are higher than  $> 0.5$  in every case too.

**Table 2** Reliability measurement index

	Cronbachs Alpha	R Square	Composite Reliability	AVE
Prior Purchase (PP)	0.541681	0.685365	0.700666	0.569239
Shopping Experience (EX)	0.623472	0.624269	0.942112	0.890587
Purchase Intention (PI)	0.532487	0.547939	0.911796	0.838383
Need for Inspection (NPI)	0.600000	0.725985	0.823175	0.701958
Web Navigation Time (BT)	0.535901	0.595474	0.805314	0.676047

Webmosphere—(WD) “*Browsing environment dimensión*”: is a dichotomous variable that identifies the web navigation environment (2D vs. 3D)

**Table 3** Discriminant validity

	PP	EX	PI	NPI	BT
PP	<b>0.754</b>				
EX	0.043	<b>0.944</b>			
PI	0.055	0.740	<b>0.916</b>		
NPI	-0.144	0.032	0.044	<b>0,838</b>	
BT	0.059	-0.008	0.061	-0.041	<b>0.822</b>

\*As per diagonal Reading the figures in bold show the AVE square root value

Regarding he Average Variance Extracted (AVE) results are close or even higher than >0.5, as recommended by [8].

The Discriminant Validity, [8] is also validated since for every variable their corresponding AVE is higher than the square of the estimated correlation among them as it is shown on Table 3.

Regarding the R2 coefficients linked to the latent variables regression are also solid value higher than >0.1 in every single case [7].

A deeper analysis across the factors, as it is shown on Table 4, highlights the existing dependence across variables and confirms all the preliminary hypothesis but hypotheses 3 and 4 , that are related to the navigation time (BT), in this case value is below <0.1

As a result of the statistical analysis we end with a validated resulting model, as it is shown below on Fig. 2. The model has been revisited and Navigation Time (BT) variable has been removed out of the original proposed model as hypotheses 3 and 4 could not be statistically validated

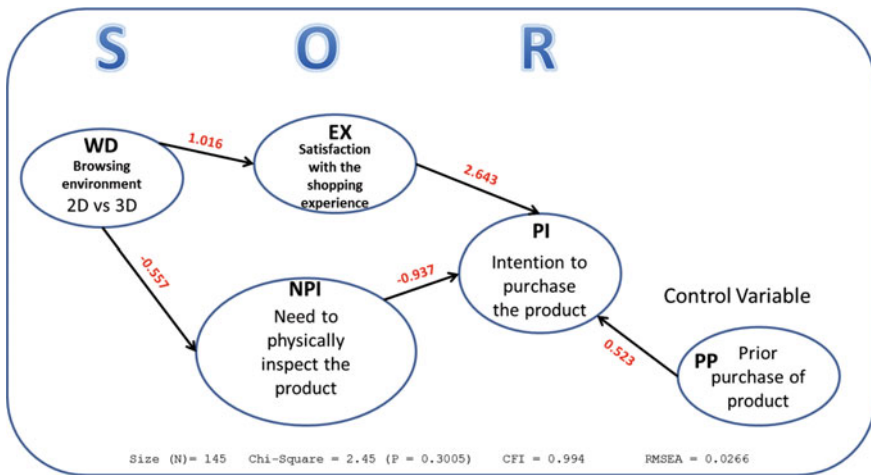
The results of the analysis showed that hypothesis 1, on the enhanced shopping experience provided to consumers by a 3D browsing environment as opposed to a 2D one, was supported. The PLS analysis yielded a very solid value of 1.016, thereby supporting this hypothesis, which suggests that the shopping experience in a virtual



**Table 4** Discriminant validity

	PP	EX	PI	NPI	BT
PP			0.523		
EX			2.643		
PI					
NPI			-0.937		
BT			<b>0.002</b>		
WD		1.016		-0.557	<b>-0.005</b>

\*As per diagonal Reading the figures in bold show the AVE square root value



**Fig. 2** Resulting structural model

store is enhanced when the level of realism of the browsing is increased through the use of a more dynamic, information-rich environment with higher-quality graphics, which “teleports” consumers to an environment more similar to those they are used to in the world of physical retail [24].

Regarding the second hypothesis, according to the PLS analysis, which yielded a score of  $-0.557$ , a 3D presentation does reduce the need to physically inspect the product. The need for physical inspection was found to be smaller in the 3D environment than in the 2D environment, and the difference was statistically significant. This supports the hypothesis that the more information users receive, the better the mental representation they are able to make of the studied object and, thus, the smaller their need to go to a physical retail outlet to inspect the product. Notwithstanding the above, while the enhanced virtual representation of a product was found to mitigate the need that many users still feel to physically see and “touch” a product before making a decision, it did not entirely eliminate it [33].

The hypothesis that a 3D browsing experience increases the time consumers spend browsing before leaving a store, initially formulated based on the expectation that

the more “pleasurable” experience would increase the customer’s desire to continue browsing in the 3D environment, was not statistically supported. This could be due to the design of the experiment itself, which established a specific browsing order—first in 2D and then in 3D—that may have conditioned the results for individuals, who experienced the 2D view before the 3D version. It would be interesting to conduct the experiment in parallel with another statistical population that was exposed first to the 3D experience and then to the 2D one in order to test whether the survey results are conditioned by the order of the experiences with each scenario.

Another possible interpretation, based on the negative result of the PLS analysis ( $-0.005$ ), is that the correlation is precisely the opposite, i.e., that the more realistic 3D browsing experience provides more detail about the product under study, thereby enabling users to get a better idea of the product more quickly and, based on this enhanced mental representation, to make their purchase decision sooner. However, this second interpretation cannot be categorically confirmed either, as the correlation result was, in any case, very weak.

Similarly, no strong correlation was found for fourth hypothesis, which stated that increasing the time customers spend browsing in the virtual store increases the likelihood that they will purchase the target product (appliance). The resulting value ( $0.002$ ), while positively correlated, was limited. This behavior has already been reported in the world of physical stores, in which numerous studies on shopping duration have shown that simply having customers in the POS for a long time is not enough to increase sales receipts and/or customer satisfaction (especially if the increase in time spent at the store is due to lines or an overly long/forced consumer journey [31]).

The fifth hypothesis, which stated that reducing the need to physically inspect the product increased purchase intention, was supported ( $-0.937$ ). This outcome was expected in light of the many studies that have measured this correlation in the past [25]. However, of particular interest was the fact that this need for “physical inspection” seemed to be even further reduced through the use of a realistic and highly dynamic representation, such as that provided in 3D, which generates an even stronger sensation of “being there” [32].

Very strong support ( $2.643$ ) was also found in the 3D scenario for the sixth hypothesis, which proposed a positive correlation between an enhanced shopping experience and the intention to purchase the target product (appliance). This finding suggests that most companies with websites currently designed for classic browsing environments should consider migrating to a more evolved, fluid, and attractive environment [16], able to provide more pleasurable experiences to potential buyers.

The last hypothesis, which proposed that prior experience with online purchases (of any product) has a positive effect on subsequent purchases via the same online sales channel, was generically supported ( $0.523$ ) in the specific case examined in this study (washing machines). As intuited, once consumers overcome their initial inhibitions regarding the virtual world, they are more likely to continue shopping in online stores in the future [10].

## 6 Conclusions

The most important technical contribution of this research is the creation of an ad-hoc website as a “test lab.” In this regard, support was provided by Quasar Labs, a company specialized in the development of virtual platforms, which reproduced the environment designed for the study in 3D.

Today, some companies have begun to take virtual 3D representation into account as a tool not only for offering customers a reality closer to the product itself, but also for providing them with simulations they can use to see the product in scenarios they create themselves.

In this regard, leading furniture and home décor companies are beginning to successfully test applications that allow customers to create their own space design, tailored to their needs, in an augmented 3D virtual reality environment. This enables them to give customers an almost perfect idea of what the final result will be like once the chosen products (furniture, appliance, decorative objects, etc.) have been incorporated into their particular reality.

Virtual 3D representation entails not only access to a more realistic scenario, closer to the experience of shopping at traditional brick-and-mortar stores, than 2D representation does, with all the implications this entails with regard to enhanced customer experience and purchase intention outcomes, as this study has shown.

As per our research results, the variable that shows a higher correlation directly linked to the Purchase Intention, is the Shopping Experience. This is also very solid correlated to the different shopping environment where it takes place. Therefore, we can assume there is an existing indirectly relation between the shopping environment and purchase intention from the consumer patronage. This supports our hypothesis than the more realistic the virtual environment looks like, the better the shopping experience is, thus the higher purchase intention consumers will have.

The outcome from our research also supports this hypothesis since the results have validated the less need for consumer physical inspection exits that will result on higher consumer purchase intention. Since there is a solid negative correlation between 3D environment and Need for physical inspection we can also validate the indirect relation between the virtual environment chosen and the final purchase intention.

Manufacturers/vendors of home appliances or other similar products featuring this research, should consider that selling those products under a 3D virtual reality scenario will have a positive impact on the consumer shopping, compared to less realistic traditional web look and feel.

Regarding research limitations we may highlight the experiment was conducted in “laboratory” conditions, i.e., using dummy/mock online environments/stores rather than actual e-tailer websites, due to the lack of e-tailers that have incorporated 3D design into their online stores.

As a second limitation the questionnaire measured only consumers’ “purchase intentions,” which influence their expected behavior; however, this influence cannot

be verified with a “real” purchase, in which they would have to complete the proposed purchase making an actual payment.

There is a last limitation since. The study focuses exclusively on durable appliances, leaving many other consumer good product categories or families (staple goods, FMCGs, fashion and apparel, etc.) unaddressed.

Finally and as future research guideline, we should include expanding the study to encompass a multichannel environment, expanding the study to include other product categories and types, and studying the impact of social media on consumer behavior in a physical environment and of how activity and visibility on social media influence the offline channel.

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