ATTENTION TO PRODUCT IMAGES IN AN ONLINE RETAILING STORE: AN EYE-TRACKING STUDY CONSIDERING CONSUMER GOALS AND TYPE OF PRODUCT

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ABSTRACT

The visual content of the product area is crucial in an e-commerce site. This paper studies the differences in attention to product images in the product area in e-commerce sites considering the effects of purchase stage and product category. Attention to product images on websites is measured using eye-tracking in two experiments with 58 students and 66 subjects, with four product categories and four purchase tasks in each one. Our results show that pictures, in general, attract attention first, before the product names and price information. Furthermore, images attract less total attention than textual information. Images attract less attention when they are not crucial for completing the task, such as when purchasing a determined product or when locating product tracking information. Younger people (less than 30) spend much less time viewing the product pictures than older age groups (50 or more). According to our results, e-retailers could improve their sites' performance by adapting the products' presentation to the purchase tasks and visitor characteristics.

Keywords: Attention; Product image; Purchase task; Eye-tracking; Web design

1. Introduction

According to Statista (2022), in 2021, global e-commerce sales worldwide amounted to 4.93 trillion US dollars, with an increase of 26% over 2020, which is especially significant due to the worldwide coronavirus pandemic. Consumers use online channels to complete purchases and combine them with physical stores and social media channels as complementary information sources or combining delivery options. This behavior is called omnichannel behavior and enhances the role of online stores in the overall purchase process (Verhoef et al., 2015).

In this context, analyzing the effect of the stimulus on retailing websites is more relevant than ever. The appearance, layout, and navigation capabilities of websites will condition site users' experiences (Hasan, 2016; Wolfinbarger and Gilly, 2003). The product area, containing product images, characteristics, brands, and prices, is the most relevant (Badre, 2002; Van Duyne et al., 2003) and receives the most attention (Cortinas et al., 2019). In this area, online retailers present the product information that plays the most significant role in consumer purchasing decisions. This information is especially relevant due to the inability to physically evaluate and touch the products in online purchases and meets the information needs of consumers (Fiore et al., 2005). Therefore, the design of this area is crucial for success (Blanco et al., 2010).

The product area usually contains both visual and textual information. Within this area, we focus on a critical type of content in the product area: product images. Product pictures transmit many characteristics of products that

are not easily translated into verbal information and, at the same time, make the site more attractive and the experience more pleasant (Desrochers et al., 2019).

Despite their importance, product images are often laid out on the webpage in the same way, regardless of the customer or product category. Algorithms make it possible to tailor the product offer and prices for each access to an online store. Online retailers use this personalization feature extensively, presenting different product assortments or even prices to each visitor. However, the personalization of the relative importance of images is far less common. The product's layout usually remains fixed between categories and consumers; changes only occur with different access devices (e.g., mobile, pc, tablet). For example, search results for women's bags and electronic watches on Amazon.com show the same layout and images; neither do they vary between identified customers and anonymous visits. Is this fixed image layout strategy optimal?

Previous literature has extensively studied the effect of pictorial versus verbal cues in advertising stimuli and online website design (Velásquez, 2013; Wang et al., 2020). Most studies suggest that images are more attractive, generate more recall and are processed at a higher speed (Blanco et al., 2010; Hong et al., 2004). Unnava and Burnkrant (1991) termed this effect the "picture superiority effect". However, the literature has not investigated whether this superiority effect varies in different situations. From the perspective of a customer's shopping journey, two factors are especially important: the task at hand and the product category. To our knowledge, there has been no research that assesses the relative attention paid to product images in different purchase situations.

In the customer's shopping journey, "consumer goals" are the different tasks to perform according to the stages of the purchase journey (Tupikovskaja-Omovie and Tyler, 2021), for example, searching for information about the products, comparing different products, and understanding delivering options. On a web page, images are atmospherics whose importance varies depending on the consumer's goal at a particular moment in an online store (Guo et al., 2016; Lee and Rao, 2010).

In addition, the type of product has been established as an influential moderator in e-commerce. There are differences in the attention process depending on the product category (Lee and Hosanagar, 2020; Luan et al., 2016). In experience products, attention to images positively affects the evaluation of the website (Desrochers et al., 2019) because products cannot be touched when shopping online, but they can be imagined (Maier and Dost, 2018). Jiang and Benbasat (2004) found that the virtual visual experience provided in certain online stores enhances the overall perceived diagnosticity of products, particularly the helpfulness of experience attributes.

We investigate the role of images in the product area depending on consumer goals and the product category. More precisely, we seek to answer the following questions: 1) Do product images attract more attention than texts in the product area of an e-commerce site? 2) How do consumers' goals and purchase stage influence the process of attention to product images? 3) How does the type of product influence the process of attention to product images? Finally, 4) How does the type of product influence the process of attention to product images in the different stages of the purchase process?

To answer these questions, we contribute theoretically using a conceptual framework that integrates two theories: Visual Marketing Attention from marketing (Wedel and Pieters, 2008) and Stimulus-Organism-Response (S-O-R) from environmental psychology (Eroglu et al., 2001; Liao, 2016; Lin et al., 2017) . This study jointly considers existing research examining how online product area presentation—stimulus in the S-O-R model and bottom-up factors, product images and textual information, in Visual Marketing Attention Theory—affects consumers' internal states—organism in the S-O-R model and top-down factors such as consumer goals in Visual Marketing Attention Theory—which, in turn, affects their purchase outcomes—response in the S-O-R model and visual attention in Visual Marketing Attention. In addition, we consider that both the product area presentation and consumer goals are affected by the type of product being considered.

We set two experimental designs to monitor product area attention in four different purchase tasks and a total of eight product categories. We measure attention to images with eye-tracking. As attention is an internal and subjective experience (Meyer and Schwager, 2007; Shi et al., 2013), this observational technique is more reliable than declarative techniques, as it does not depend on users' willingness or competence to describe how they feel when exposed to a web page (Ariely and Berns, 2010). In Study 1, we test our research hypotheses in a research design with four different product categories and four purchase tasks in a convenience sample of 58 students. In Study 2, we increase the validity of our results with a study of 4 additional categories and a more diverse sample of 66 individuals.

Both studies aim to improve our understanding of the effect of the purchase stage and product category on attention to product area, emphasizing visual product information online. Unlike previous research focused on the process of user attention to product images in particular stages of the online purchase journey (Boardman and McCormick, 2019; Desrochers et al., 2019; Wang et al., 2014, 2016) this study highlights the attentional processes to product images in the different stages of the online purchase journey while simultaneously considering the effect of the product category. If there are no differences in attention in different situations, the personalization of the layout

would not add any advantages for customers' information processing. On the other hand, if the attention to images differs in different situational contexts, retailers could improve their websites' performance by adjusting how they present the information. This research provides valuable information that internet retailers can use to develop more effective product presentations that meet consumers' needs for proper product evaluation in internet shopping.

In the next section, we present the conceptual framework, which includes the attention to the product area model and our hypotheses regarding the effects of purchase task and product category. Section 3 describes the research design used in Study 1, including the definition of the treatments, materials, participants, procedures, measures, and results. In Section 4, Study 2 is presented with the same structure as Study 1. Section 5 expands the discussion of the results. The last section summarizes our conclusions, future research lines, and the studies' limitations.

2. Conceptual Framework and Hypotheses

Attention is a cognitive phenomenon that has been intensively studied since the late nineteenth century. Attentional processes are the means of treating the vast amount of information individuals confront, prioritizing some aspects of that information while ignoring others (Näätänen, 2018); they include visual attention, auditory attention, spatial attention, and phenomena such as selective attention, divided attention, and distraction (Pashler, 2016). These processes are antecedents of other functions, such as learning, preference formation, and product choices (Wedel and Pieters, 2006).

Attentional processes devoted to visual stimuli are especially relevant. As Wedel and Pieters (2008) note, "...visual attention is important in its own right. First, ... visual attention is not only a gate, but ... a key coordinating mechanism that serves to maintain information processing and other goals over time". Visual Marketing Attention Theory (Wedel and Pieters, 2008) differentiates two types of factors affecting attention to visual marketing stimuli: bottom-up and top-down factors. The former is derived solely from the visual scene and results from color, contrast, shape, and texture (Velásquez, 2013). These visual stimuli prompt bottom-up attention, also called stimulus-driven attention. In contrast, top-down factors are individuals' unique aspects and characteristics, such as their expectations, goals, and emotions. Top-down attention refers to voluntary attention assigned to particular objects and directed by a person's current task or goal-orientation attention (Corbetta and Shulman, 2002; van der Laan et al., 2015).

In a different research stream, from the field of environmental psychology, Mehrabian and Russell (1974) developed the Stimulus-Organism-Response (S-O-R) model as a theoretical basis for studying the effects of contextual stimuli on people's behavior. S-O-R posits that various aspects of the environment act as (S)timuli that affect the internal states of people or (O)rganism, which, in turn, affect their behavioral intentions or (R)esponses (Lin et al., 2017). (S)timuli include various aspects related to environmental factors and conditions, including social, design, and ambient elements (Herrando et al., 2018). (O)rganisms are the inner states of perceptions, feelings, and thinking exercises (Luqman et al., 2017). These internal states result in specific behavioral (R)esponses by consumers, comprising both approach and avoidance behaviors (Ettis, 2017). After Mehrabian and Russell (1974) proposed the S-O-R framework, Rossiter and Donovan (1982) applied the concept to the retail context and Eroglu et al. (2001) to online retailing.

Cortinas et al. (2019) combine the visual marketing attention theory approach and the S-O-R framework. In this general framework, the bottom-up factors in the Visual Marketing Theory of Wedel and Pieters (2008) are equivalent to the External (S)timuli in the S-O-R framework and the concept "atmospherics" of Eroglu et al. (2001). The top-down effects in the Theory of Attention to Visual Marketing include internal states included in the (O)rganism term and (R)esponse states.

This paper uses this integrative framework to study two of these factors and their relationships: a bottom-up factor, the product images in the website's product area, and a top-down factor, the purchase task. We also consider the potential moderating effect of the product category. The research model is presented in Figure 1. In the next subsections, we focus on the role of each of these elements.

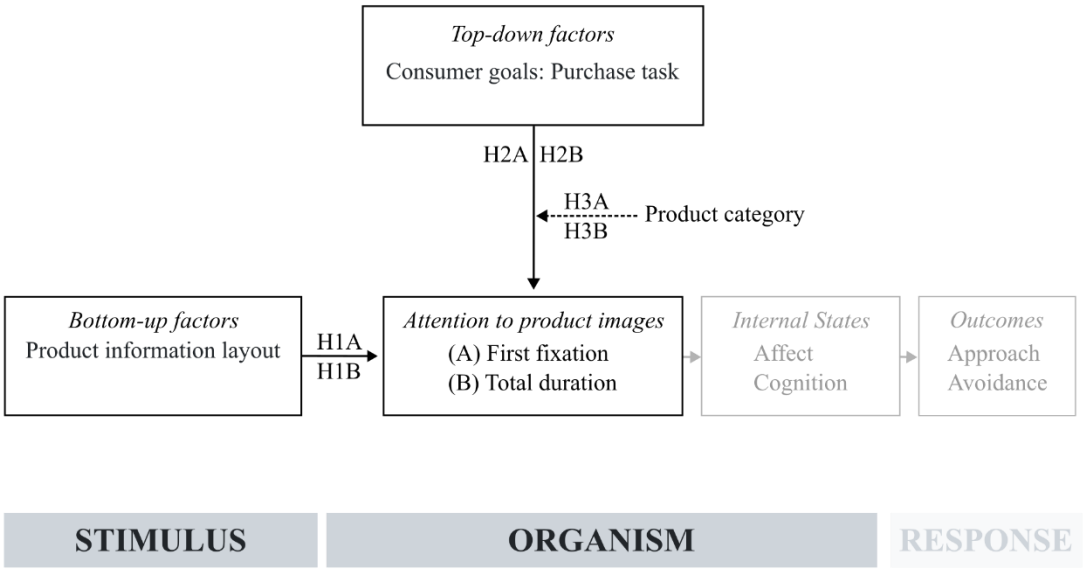

Figure 1: Conceptual Framework

2.1. The Role of Product Images in the Attention to E-Commerce Sites

The area of an e-commerce site in which products are presented is called the product area or "area of marketing information," and it is critical to helping retailers perform their function (Badre, 2002; Blanco et al., 2010; Van Duyne et al., 2003). Its place is usually the center of the screen, with greater importance than the retailer's logo or service information. In this area, we can distinguish two types of information: pictorial stimuli (e.g., images that portray the product) and verbal stimuli (e.g., the brand name, product description, or product price). Both types of content comprise the bulk of product presentation on typical online shopping websites and are relevant and useful for purchase-related tasks (Yoo and Kim, 2014).

Visual marketing research has analyzed the differential effects of pictorial and verbal stimuli to attract attention, especially in the context of attention to commercial advertising (Hernández-Méndez and Muñoz-Leiva, 2015; Pieters and Wedel, 2004; Yangandul et al., 2018). The general conclusion is that images attract more attention than texts, communicate more information, and are remembered for longer (Adaval et al., 2018), leading to what is called the images' superiority effect (Childers and Houston, 1984; Unnava and Burnkrant, 1991). However, attention to images usually spans a shorter time, as their perception is faster and more automatic than the perception of texts and requires less effort and time (Rayner, 1998). Rayner et al. (2001) showed that the participants in their experiment spent more time looking at an ad's text than at the image but processed the pictures first. Other authors have obtained similar results: more time is invested in verbal content, although this content is not processed first (Hernández-Méndez and Muñoz-Leiva, 2015).

In the context of online shopping, the research focused on the product area also found that images of a garment on a model, mannequin images and zoom function all received a considerable amount of attention and had the most influence on consumer decision-making (Boardman and McCormick, 2019). However, the differences in attentional processes between visual and pictorial cues in the product area have not been explicitly addressed.

We establish our first two hypotheses by referring to the attractiveness of the images and to what it costs to assimilate them:

H1A: Product images attract attention faster than brand name and product price in the product area.

H1B: Product images attract less total attention than brand name and product price in the product area.

2.2. Consumer Goals

Recent studies in the context of e-commerce have explored the pictorial content of product presentations considering different factors (see the summary of previous literature in Table 1).

However, none of these studies consider the different stages of the purchase process, which are also an essential determinant of the process of attention to the presentation of online products (Cortinas et al., 2019; Ohman et al., 2001; Rowley, 2000). Consumers visit websites with many different objectives in mind, for example, comparing prices with

a physical store, browsing attractive products, or checking the status of an order (Mangiaracina et al., 2009). The relevance of the different stimuli is very different in each of these cases (Puccinelli et al., 2009), and users will direct their attention to the stimuli that are most informative for their current goal or task (Rayner et al., 2008; Van der Laan et al., 2015).

In the context of e-commerce, the consumer purchase process should be viewed as a sequence of three stages (Neslin et al., 2006): the prepurchase stage (in which the consumer seeks information and analyzes it to make a decision), the purchase stage (where the consumer makes the purchase), and the postpurchase stage (which involves, for example, the use of customer services or the dissemination of opinions or reviews on products) (Neslin et al., 2006).

In each of these stages, the relative importance of the different atmospherics varies according to their relevance (Guo et al., 2016). For example, Eroglu et al. (2001) grouped the online establishment's environmental stimuli into high task-relevant and low task-relevant cues. High task-relevant cues are site descriptors that facilitate making the purchase. Low task-relevant cues are those that are relatively irrelevant to completing a particular purchase stage, such as colors or font families on the website.

The product images transmit the product's visual aspect and information about its attributes and characteristics. Images provide a more holistic perception of a product's brand (MacInnis and Price, 1987). These images are, therefore, especially relevant in situations involving product choice. In contrast, product images are less relevant in the purchase phase, when the product is already chosen, or in the postpurchase stage, where consumers search for information about the services. In these phases, verbal content such as sales, delivery, and return policies are likely to be more relevant. Therefore, our second hypothesis states the following:

H2A: Product images attract attention faster in the choice stage, when they are relevant to the task, than in the purchase and postpurchase stages, when they are not.

H2B: Product images attract more total attention in the choice stage, when they are relevant to the task, than in the purchase and postpurchase stages, when they are not.

Table 1: Research on Attention to Visual Presentation of Products in Online Environments

Authors	Aims	Theoretical foundation	Methodology	Outcomes	Product category	Task
Bigne et al. (2020)	This study analyses how pictorial content and the sequencing of online reviews affect consumer information processing.	Stimulus-Organism-Response model (SOR)	Eye-tracking data and an online questionnaire	The visual attention paid to the pictorial content is conditional on the attention given to the text.	Experience: restaurants	Search online reviews about a restaurant
Boardman and McCormick (2019)	This paper aims to investigate if there are any differences in responses to product presentation (product images, zoom-function, product videos) between age groups in the decision-making processes.	Stimulus-Organism-Response model (SOR)	Eye-tracking (visual perception) and qualitative in-depth interviews (cognitive and affective responses)	Images of the garment on a model, mannequin images and zoom-function all received a considerable amount of attention and had the most influence on consumer decision-making. The research also found that there were differences between age groups in their responses to product presentation that there were differences between age groups in their responses to product presentation features.	Experience: Apparel products	Free-browsing task
Desrochers et al. (2019)	The purpose of this paper is explored how type of product being purchased and the arithmetical complexity of the shopping task, influence the attitude of consumers toward online grocery websites, looking into the moderating roles that cognitive load and visual attention to product pictures play in these relationships.	No specific theory	Eye-tracking data and a questionnaire	Increased visual attention on the pictures of experiential products had a significant positive effect on attitude toward the site. For more arithmetically complex tasks, increased visual attention on product pictures had a marginally significant negative effect on attitude toward the site.	Experience (unpackaged goods) and search (packaged goods): grocery items	Online grocery shopping tasks
Wang et al.(2016)	This study examines the interaction effects of the online product presentation (textual description and pictures with text description) and online reviews on consumers' attention under different involvement situations.	Cue utilization theory	Eye-tracking data and a survey	The results show that high rich product presentation (textual description and pictures with text description) and high seller reputation lead to better product quality perception. Furthermore, when seller reputation was low, high rich product presentation led to better quality perception.	Search: laptop and electronic dictionary	Free-browsing task
Wang et al. (2014)	This study explores the product pictures (with and without human image) on consumers' online shopping emotions and subsequent attitudes towards websites.	Stimulus-Organism-Response model (SOR)	Eye-tracking experiment and questionnaire data	The results show that participants paid more attention to product picture integrated with human image in apparel, while for headphones, in conditions either with or without human image, participants paid much more attention to the functional information of headphones than the product picture.	Entertainment products (apparel) and utilitarian products (headphones).	Free-browsing and shopping tasks

2.3. Type of Product

Online channels are less capable of transmitting sensory information. In the online environment, we perceive products only through sight and sometimes through hearing, but not through touch, taste, or smell, so they remain intangible (Laroche et al., 2005). These limitations make some consumers reluctant to use online channels in their purchases (Citrin et al., 2003; Levin et al., 2003) because it is more challenging to evaluate the products and, therefore, the risk is greater (Dai et al., 2014).

The weakness of online channels providing sensory information can be more or less critical, depending on the type of product. Nelson (1970) divided product categories depending on their possibilities of evaluation before the purchase. If consumers can determine most of one product attribute before the purchase, he called it a "search product"; in contrast, if most product features are unknown until the purchase or the consumption of the product, he called it an "experience product". Later, in the same vein, Chiang and Dholakia (2003) and Weathers et al. (2007) define search goods as those in which consumers can obtain complete information before purchasing and experience goods as those requiring direct experience. Consumers can evaluate search products by their features, brand, or price, while experience goods need senses for their evaluation. Similarly, Lynch et al. (2001) use the terms "low-touch" for search goods and "high-touch" for experience goods.

Online retailing is particularly challenging in the presentation of experience products because these are predominantly evaluated on sensory criteria, but not all senses can be similarly stimulated in an online environment. The relevance of images will therefore be higher for these products. Maier and Dost (2018) found that experience (vs. search) products benefit more strongly from mental imagery, and Jeong et al. (2009) found that visual information elicits greater experiential value. In this sense, MacInnis and Price (1987) previously postulated that the processing of images generates a more emotional sensory experience; thus, in a product with a high load of experience attributes, evocation can be greater.

The literature has also found differences in attentional processes according to product type. Luan et al. (2016) explore differences in the attention to product reviews, finding that the attention to product reviews broken by attributes is greater for search products than for experience products. Additionally, Lee and Hosanagar (2020) detect more attention to product recommendations in experience product categories than in search product categories. Specific studies on the attention to visual information of products have also considered the effect of the type of product. Desrochers et al. (2019) studied the effect of attention to images in online stores' global evaluation, finding that increased visual attention to the pictures of experiential products had a significant positive effect on attitude toward the site. Wang, et al. (2014) explored the effect of product pictures (with and without a human image) on consumers' online shopping emotions and subsequent attitudes toward websites. Their results show that participants paid more attention to product pictures integrated with human images in apparel (experience product), while for headphones (search product), in conditions either with or without human images, participants paid much more attention to the functional information about the headphones than the product picture.

The results of all these studies show that, in one way or another, individuals pay more attention to visual information to obtain clues about details that they cannot perceive through other senses. Thus, consumers process information differently when facing different types of products. However, to our knowledge, the differences in the attention to images between product categories have not been analyzed considering the stages in the purchase process. We expect an interaction effect in the attention to images between the product category and the purchase task. The need for information for experience products is more considerable when the consumer compares the different alternatives in the prepurchase stage than in the posterior stages. For search products, the products' images are not very relevant in any purchase process phase. We expect a more similar level of attention related to the general interest generated by pictorial representations. Therefore, our third hypothesis is as follows:

H3A: Images attract attention faster in the choice stage in experience product categories than in search product categories.

H3B: Images attract more total attention in the choice stage in experience product categories than in search product categories.

We test these hypotheses by means of two independent studies. The experimental designs of both studies were similar. The variations occur in the products considered and in the variation of the characteristics of the individuals in the sample to generalize the results.

3. Study 1

3.1. Definition of the Treatments

After a pretest study with qualitative interviews, we selected four different tasks and four different product categories to test our hypotheses. We define a task for each of the stages in the purchase journey. Our definitions of tasks are similar to those used in previous studies (Leuthold et al., 2011; Reutskaja et al., 2011; Wang et al., 2014).

- Task 1: Exploration Task: “Rate the website for overall appeal.”
- Task 2: Choice Task: “Visit the website and select from those offered the product that most appeals to you based on the information provided.”
- Task 3: Purchase Task: “Add option X to the shopping cart.”
- Task 4: Postpurchase Task: “Find how to track your order.”

Product images are useful information in selecting one product and somewhat useful in evaluating the website appeal. In contrast, they are not necessary for the other three tasks: adding a named product to the cart and finding tracking information.

We also select four product categories with varying degrees of search and experience attributes (Mitra et al., 1999). The selected product categories are:

a) With experience attributes: sports shoes.

b) With search attributes: mobile phones, ballpoint pens and hard disks.

We consider sports shoes as experience products, while mobile phones, ballpoint pens, and hard disks are considered search products with different risk levels. Previous studies have used electronics to represent search products and clothing and shoes as experience products (Huang et al., 2014; Kim and Lennon, 2008; Levin et al., 2003; Luan et al., 2016).

3.2. Materials

We implement the experimental design by creating four mock retail websites, one for each product category (see Figure 2).

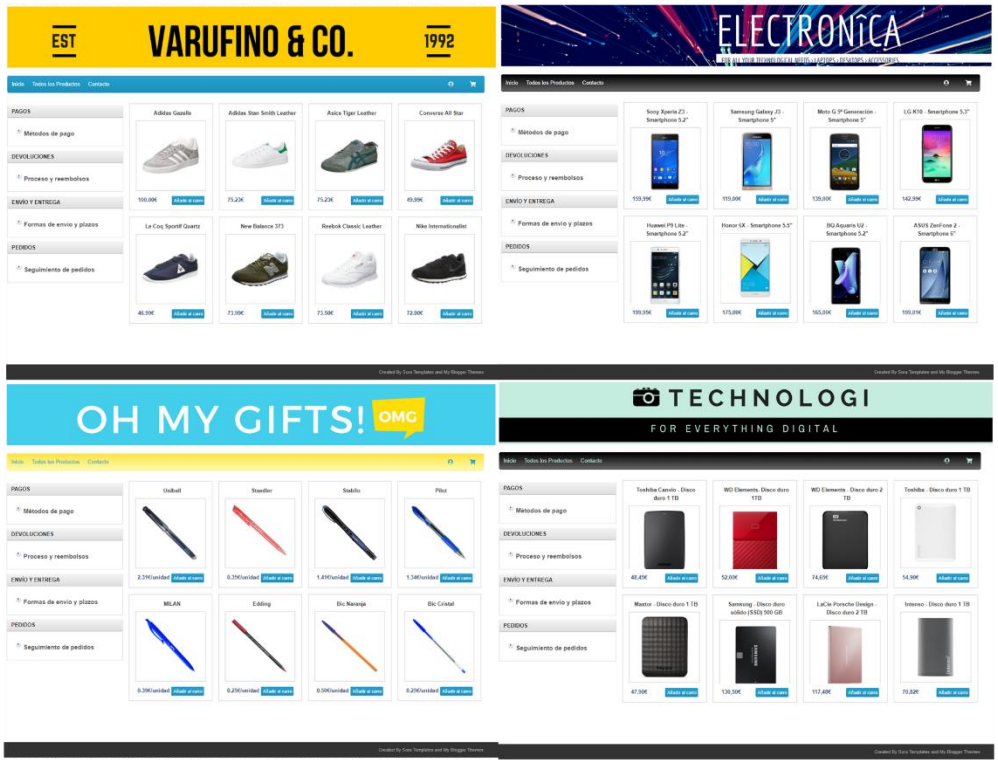

Figure 2: Simulated E-Commerce Stores for Study 1: Shoes, Mobile Phones, Ballpoint Pens and Hard Disks

Each online store offers only one product category. Using simulated websites is not new to this type of research (Leuthold et al., 2011; Wang et al., 2014). These types of web experiments can be perceived as real businesses with real online interactions (Hantula, 2005). Our mock websites, even if they lose something in realism, enable stricter control of other effects that might bias the results and the exact location of the Areas of Interest (AOIs).

We use the same realistic e-commerce template, a natural-looking e-commerce website layout, and then vary the colors, brand logos, and font families in the four stores. Visual stimuli (images of items) and extrinsic information (product name and prices) about the products were collected from actual commercial websites to be attractive to target

customers and encourage research participants to behave more realistically (Kim et al., 2019). To avoid extraneous factors, only pictures of items without human models were selected. All images have the same white background to eliminate confounding mental imagery effects (Maier and Dost, 2018). In the four stores, the product area is in the center of the screen, with eight different products, showing the product name above, the product image in the middle, and the product price and cart option at the bottom (see Figure 3 for our definition of AOIs). This layout is widespread in e-commerce sites (Bernard and Sheshadri, 2004).

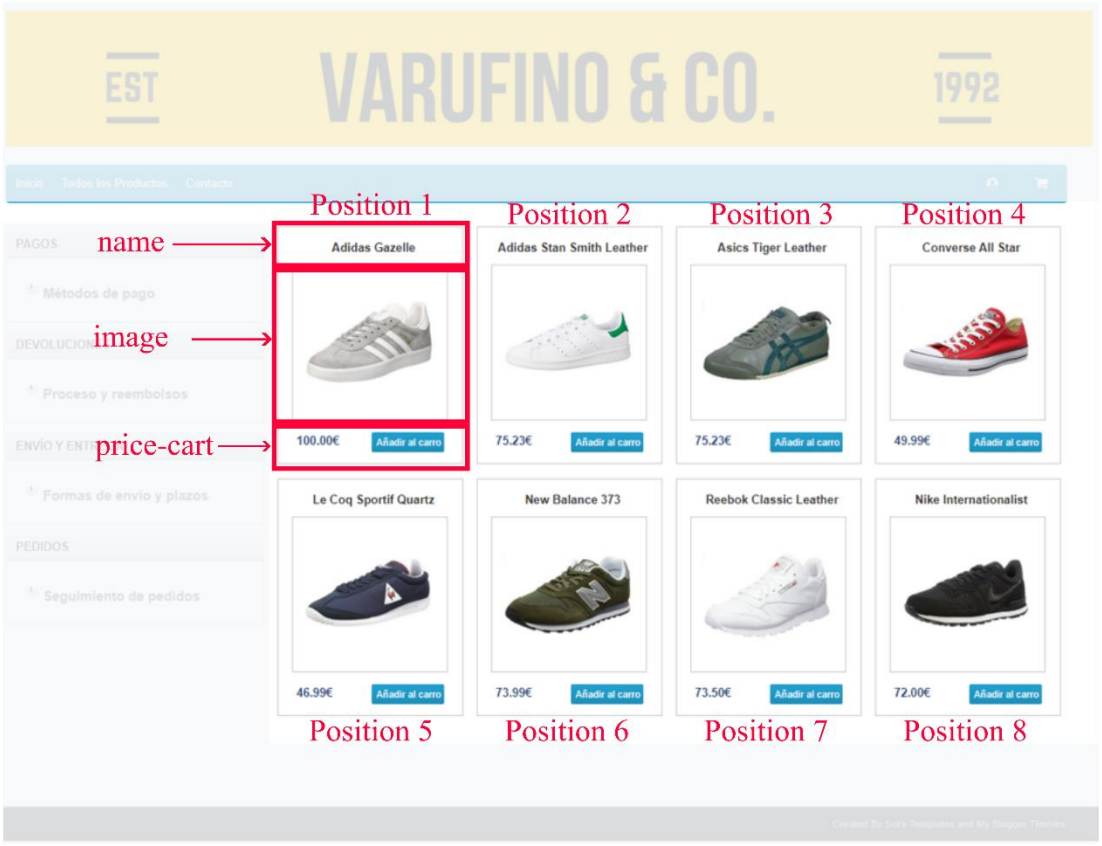

Figure 3: Definition of Areas of Interest. Product Area in which the Name, Image and Price of the Product Are Highlighted

3.3. Participants and Procedure

The research team recruited 58 college students in their fourth year of a degree course in Business Administration and Management and invited them to the laboratory for data collection. These students were enrolled in an optative subject in Information Systems taught by the researchers of this project, which offered them the opportunity to experience eye-tracking technologies firsthand in exchange for course credit. All volunteers noted their availability on the day and time that best suited them from those available and visit the laboratory in the same week. The university's ethical committee first approved the procedure, and the participants provided their written, informed consent to participate in this study. Other eye-tracking studies have shown that students are valid subjects when analyzing attentional processes on websites (Djamasbi et al., 2010; Leuthold et al., 2011; Reutskaja et al., 2011; Velásquez, 2013). Similar studies of attention to visual information, including eye tracking, have used similar sample sizes (e.g., 50 participants in Boardman and McCormick (2019)).

We carried out the data collection phase of Study 1 in April 2018. The 58 subjects were, on average, 25 years old, and 60% of them were women. Regarding the product categories, as expected, participants have more knowledge about sport shoes and mobile phones, and hard disks are the least known products. The recruits were then instructed to sit on a chair approximately 65–70 cm in front of the eye tracker, which was placed beneath the stimulus computer

monitor, while their eye movements were monitored. All participants had normal or corrected-to-normal vision. We chose to conduct the experiment in a controlled lab environment to avoid possible biased interruptions.

The subjects' level of attention across task types was measured using purpose-designed eye-tracking hardware comprising a camera and an infrared light. The specific choice of hardware for this study was The EyeTribe Tracker. According to its manufacturers, the EyeTribe Tracker has an average accuracy of 0.5°, a spatial resolution of 0.1°, and an average frame rate of 30 Hz. This eye-tracker's spatial precision and accuracy are good enough for fixation checking, point-of-regard analyses, and pupillometry (Dalmaijer, 2015). The system monitors the subject's gaze throughout the trial and registers eye fixations according to a specified spatial dispersion criterion.

The eye-tracker's calibration procedure took place, and each subject was randomly assigned to task/category pairs. Each participant completed four tasks and visited the four category stores. However, the task-category pairs were different for each subject. There was no time limit placed on any task. We used the Qualtrics online platform for random store-task pair assignment and questionnaire implementation. Thus, for example, individual 1 had to complete the exploration task in the sports shoes store, the choice task in the mobile phone store, the purchase task in the ballpoint pen store and the postpurchase task with the hard disks. An individual never performed the same task twice and always visited all four category stores. The questionnaire also included several demographic questions after all four tasks were completed.

Data collection, including eye-tracker instrument calibration, questionnaire completion, and associated tasks, took approximately 15 minutes per person. As a reward, we include them in a raffle with several 20€ Amazon shopping vouchers. A researcher accompanied the subjects throughout this process.

3.4. Measures

A fixation is a quasi-stable position of the eye for a minimum of 200 milliseconds. The requirement for a quasi-stable position requires that the angular dispersion of the eye be below 1°. The fixation check procedure filters out noise in the gaze data. Our process only records fixations within the selected areas of interest; thus, outliers in the gaze patterns are filtered out. Once the trial was complete, we took the gaze position coordinates and time patterns across the four tasks, and the subject's fixation times were recorded and classified by AOI and type of task. We checked for outliers in the completion time for each task, using 1.5 times the interquartile range of the completion time as the range for discarding outliers (e.g. Kar, 2020) and excluding 14 tasks performed by 12 individuals.

There are different possibilities for analyzing fixation patterns (Wedel and Pieters, 2008). Given our objectives, we construct two attention indicators:

- Indicator of attraction by one AOI: number of fixations before the participant fixated on the AOI for the first time. This indicator is an inverse one, as lower values indicate greater attraction capacity.
- Indicator of attention intensity in one AOI: number of fixations in an AOI (image, brand information, price information) standardized by 10,000 pixels.

Feedback from the questionnaire complemented this information to control potentially unobserved subject characteristics that might affect each task's attention and time. The questionnaire included information on purchase habits, category knowledge, and subject characteristics, such as online shopping experience and demographics. The individual attention patterns obtained by the eye tracker were linked to the declarative data from the questionnaire by a unique code generated by Qualtrics for each questionnaire to ensure anonymity for the subjects.

3.5. Results: Study 1

We analyze the importance of images compared to information about the product's name and information about the price. The first two columns in Table 2 (part A) show the average number of fixations on the web page before each AOI and the standard deviation of this variable. The fewer the number of fixations before an area, the sooner it attracts attention. The number of fixations in an area before an image (mean= 53.62) is lower than in the name (mean= 71.54) and price (mean= 105.92) areas, indicating that individuals pay attention to images before other AOIs. The last two rows of Table 2 show the result of the ANOVA test for this variable (F= 13.456, p= 0.000). These results confirm Hypothesis 1A. Besides images, the name of the product draws attention in the second fastest place and the price is the third.

The last two columns in Table 2 (part B), show the mean and standard deviation of the number of total fixations in each AOI, standardized per 10,000 pixels. As expected, total attention to images (mean= 5.39) is slightly less than attention to name (mean=6.87) and price (6.37) areas. The last two rows show the result of the ANOVA test for this variable (F= 2.395, p= 0.092). We find evidence to confirm Hypothesis 1B at the 10% level. The images are the ones that are processed the fastest, followed by the price area and lastly the name of the product. Text elements require more viewing time.

Table 2: Fixations before AOIs and Fixations by 10,000 Pixels (Study 1)

	(A) Number of Fixations before element		(B) Total Fixations by 10.000px	
AOI	**Mean**	**Std. Dev.**	**Mean**	**Std. Dev.**
Image	53.62	79.87	5.39	5.51
Name	71.54	113.34	6.87	8.57
Price-cart	105.92	106.19	6.37	6.26
F value	13.456		2.395	
Pr(>F)	0.000***		0.092*	

* significant at 10% level
*** significant at 1% level

To test Hypotheses 2A, we use the number of fixations on the web page before an image and compute the average values and the standard deviation of this variable considering the different tasks, product categories, product positions and gender of the subject (Table 3 - part A, first three columns). In addition, the last rows of part A of Table 3 correspond to the ANOVA tests. According to Hypothesis 2A, we expect that product images attract attention faster in the choice stage than in the purchase and postpurchase stages. However, the results show precisely the opposite. Images attract attention earlier in the purchase stage (mean= 81.93) and prepurchase stage (mean= 109.12) than in the choice (mean= 123.46). An ANOVA test on number of fixations before images in task revealed a significant main effect (F= 8.746, p= 0.000). Thus, regarding the attraction effect, there are significant differences in the number of fixations before images between tasks, but the fewest fixations take place in the purchase stage and the postpurchase stage. Therefore, Hypothesis 2A is rejected.

To test Hypotheses 2B, we compute the mean and standard deviation of the number of total fixations in images considering the different tasks, product category, product position and gender of the subject, standardized per 10,000 pixels, which are shown in the last two columns of Table 3 (part B). The last rows of part B of Table 3 report the results of the ANOVA tests. Images attract more attention when they are relevant to the task at hand, in the choice stage (mean=30.37) and images attract less attention when they are not crucial for completing the task: when purchasing a product defined by its name (mean= 12.58) or when locating product tracking information (mean= 17.51). Table 3 also shows that the differences in the total number of fixations by tasks is significant (F= 26.891, p= 0.000). Hypothesis H2B is therefore confirmed.

In addition to the analysis of the differences by task, Table 3 also shows the average and standard deviation of number of fixations on the web page before an image and total fixations in images considering the product categories and the position of the product on the webpage of the product considered. We also account for gender as a control variable. There are differences in the average number of fixations before images between categories (F= 13.480, p= 0.000). The average number of fixations before images are lower for ballpoint pens (mean= 89.74) and sport shoes (mean= 92.20) and higher for mobile phones (mean= 133.61) and hard drives (mean= 139.52). There are not significant differences in the average total fixations in images (F= 0.509, p= 0.676).

Regarding the position of the images in the stores, we detect a significant main effect of the product position in the number fixations before images (F= 16.634, p= 0.000) and total number of fixations (F= 2.320, p= 0.024). Images in the upper row (means 49.63, 69.22, 105.68, 128.09) attract attention earlier than images in the second row (means 146.53, 135.55, 139.57, 155.20). The product located in the second row farthest to the right is the last to attract attention (mean= 155.20). The image in the second position of the first row (mean= 25.57) and the third product in the second row (mean= 26.42) attract more attention, and the first images in the second row (mean= 17.78) attract less attention.

Table 3: Fixations before Images and Fixations in Images by 10,000 Pixels (Study1)

	(A) Fixations before images		**(B) Total Fixations in images**	
	Mean	**Std Dev.**	**Mean**	**Std Dev.**
Task:				
Site exploration	128.57	121.96	23.06	25.47
Product choice	123.46	149.31	30.37	31.13
Purchase	81.93	76.09	12.58	17.57
Postpurchase	109.12	104.32	17.51	21.68
Category:				
Sport Shoes	92.20	87.80	21.70	27.18
Mobile Phones	133.61	134.73	24.74	27.78
Ballpoint Pens	89.74	101.11	20.88	22.95
Hard Disks	139.52	149.55	21.86	26.73
Product Position:				
Position 1	49.63	82.12	23.31	25.13
Position 2	69.22	79.71	25.57	25.44
Position 3	105.68	102.69	21.68	26.49
Position 4	128.09	107.42	19.43	23.43
Position 5	146.53	135.87	18.78	21.07
Position 6	135.55	119.07	21.53	29.61
Position 7	139.57	142.23	26.42	33.36
Position 8	155.20	156.96	20.79	23.83
Gender:				
Male	118.34	126.19	20.81	25.06
Female	110.13	119.25	23.60	27.40
ANOVA Test	**(A) Fixations before images**		**(B) Total Fixations in images**	
Variable	**F value**	**Pr(>F)**	**F value**	**Pr(>F)**
Task	8.746	0.000***	26.891	0.000***
Category	13.480	0.000***	0.509	0.676
Product Position	16.634	0.000***	2.320	0.024**
Gender	1.434	0.231	1.606	0.205
Task*Category	4.913	0.000***	2.306	0.014**
Task*Product Position	0.742	0.791	1.037	0.415

** significant at 5% level
*** significant at 1% level

We find no significant effect of gender neither in the variable fixations before images (F= 1.434, p= 0.231) nor in the number of total fixations in the images (F= 1.606, p= 0.205).

Finally, to test Hypotheses 3A and 3B, regarding the different effect of product category for different tasks, we represent the interaction effect of the task and the category in the attention to the images in Figure 4. We compare the attention to images in one experience category (sport shoes) and three search categories (mobile phones, ballpoint pens and hard disks).

First, Panel A in the upper part of Figure 4 shows the interaction effect of task and category for the variable fixations before images. According to Hypothesis 3A, we expect that images attract attention faster in the choice stage in the experience product category (sport shoes) than in the other three search product categories. Focusing on the choice stage in Figure 4A, results confirm that images attract attention faster in the choice stage in the experience

product category (sport shoes) than in two search product categories, mobile phones and hard drives, where the product description is more useful for making product choices. We do not find significant differences between ballpoint pens and sport shoes. Penultimate row in Part A of Table 3 also shows that the general interaction effect between task and category significant (F= 4.913, p= 0.000). These results lead to confirm Hypothesis 3A for all categories but ballpoint pens: images attract attention faster in the choice stage in the experience product category than in search product categories.

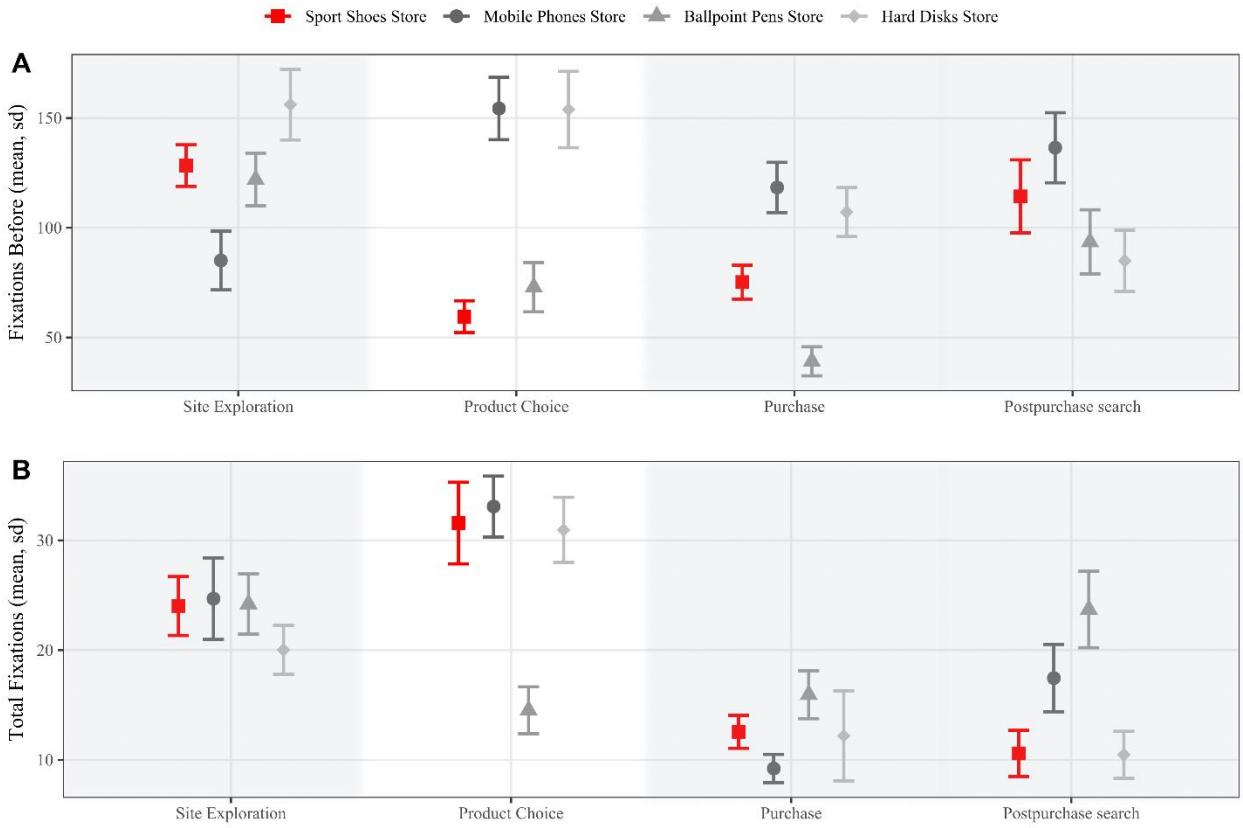

Figure 4: Interaction Effect of Task and Category in Attention to Images (Study 1)

Panel B in the lower part of Figure 4 shows the interaction effect of task and category for the variable total fixations in images. According to Hypothesis 3B, we expect that images attract more total attention in the choice stage in the experience product category (sport shoes) than in the other three search product categories. The hypothesis cannot be accepted. Focusing on the choice stage in Figure 4, there are not significant differences in the total number of fixations in images between sport shoes and mobile phones or hard disks. Hypothesis 3B is only accepted for the ballpoint pen category that shows significantly lower total fixations in images. Penultimate row in Part B of Table 3 also shows that the general interaction effect between task and category is significant (F= 2.306, p= 0.014).

4. Study 2

To deepen the study of the product category effect, we design Study 2 with more categories with experience characteristics; four new product categories are included. We also include, in this case, a more diverse sample of individuals in terms of age and education and use a better hardware device, a Tobii Pro Nano with a frame rate of 60 Hz, instead of the 30 Hz Eyetribe device used in Study 1.

4.1. Experimental Design

We performed the second experiment to reinforce the test of the hypotheses, with four types of tasks combined with four product categories. The experimental design of Study 2 is similar to that of Study 1, except for the following differences:

1. All tasks are the same, except task 3. In Study 1, the purchase task was to add a specific model to the shopping cart, and in Study 2, the individuals had to add the cheapest model. We decide to include this change to focus the attention on this task in the price area instead of the name area (see Figure 3 for the definition of the

areas). In Study 1 we found that the subjects paid more total attention to the area of the product name than to the rest (see Table 2, part B). We believe that this result is a direct consequence derived from the very design of the experiment. The selected tasks of Study 2 are:

- Task 1: Exploration Task: "Rate the website for overall appeal."
- Task 2: Choice Task: "Visit the website and select from those offered the product that most appeals to you based on the information provided."
- Task 3: Purchase Task: "Add the cheapest option to the shopping cart."
- Task 4: Postpurchase Task: "Find how to track your order."

2. The product categories change: in Study 1, we considered one experience product and three search products, and in Study 2, we considered three experience products and one search product. The selected product categories are:
   a) With experience attributes: backpacks, study chairs, and T-shirts.
   b) With search attributes: computer screens.

4.2. Materials

For this experiment, we created four simulated online shopping websites. The setting of the simulated websites was similar to Study 1. All the design elements on the four websites were the same except for the specific product names, pictures, and prices (see Figure 5).

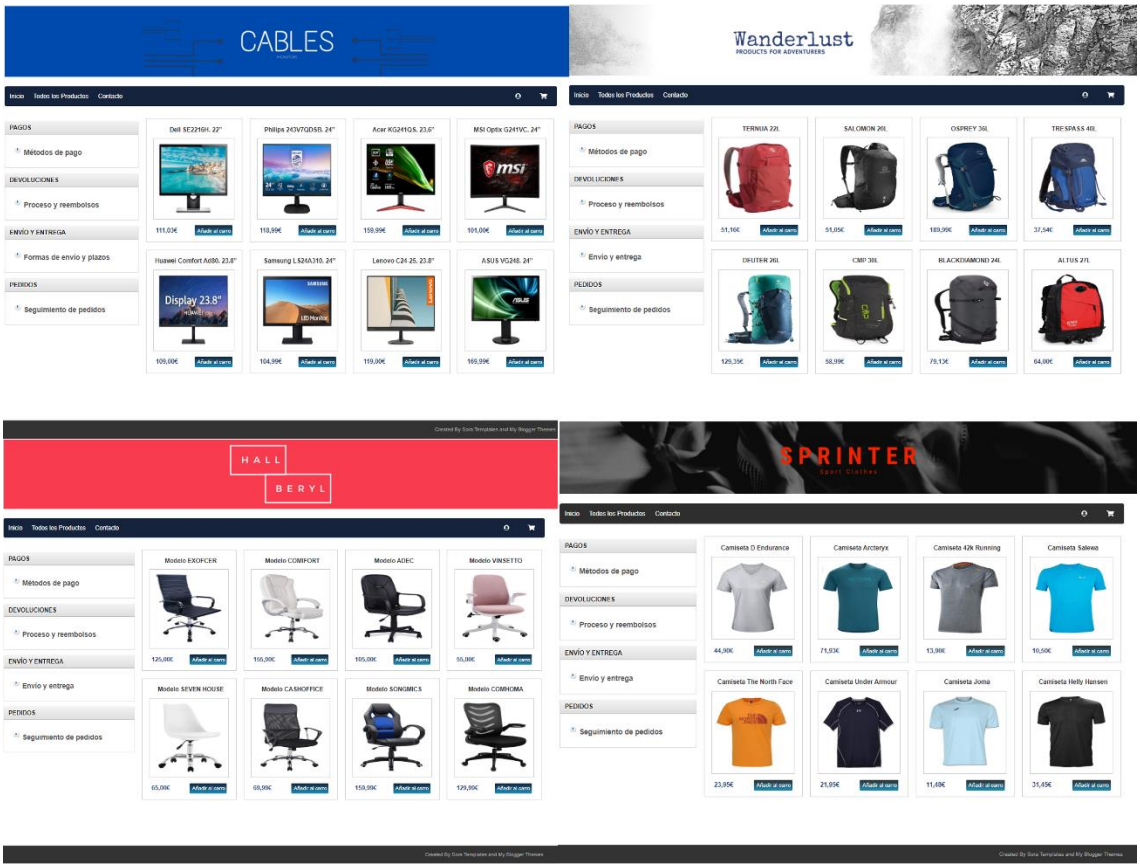

Figure 5: Simulated E-Commerce Stores for Study 2: Backpacks, Study Chairs, T-shirts, Computer Screens

4.3. Participants and Procedures

The participants in Study 2 did not overlap with the participants in Study 1. A total of 70 participants, (40%) males and (56%) females with an average age of 40 years were recruited from a specialized market research company. Data collection for the study took place in February 2022. Table 4 shows the descriptive statistics of both study 2 and 1.

Table 4: Descriptive Statistics

	Study 1		**Study 2**		
Gender	Male N = 23 (40%)	Female N= 35 (60%)	Male N= 26 (40%)	Female N= 37 (56%)	Other / Not declared N= 3 (4%)
	Mean	Std Deviation	Mean	Std Deviation	
Age in years	24.79	4.73	39.87	14.19	66
Time completing each task (in seconds)	11.7	8.25	13.96	5.78	

Study 2 was conducted following the same sequence as in Experiment 1, so we made this exposition shorter. We first conducted a pilot experiment with seven participants to test the experimental process and appropriateness of the experimental setting. With no concerns raised from the pilot study, the formal experiment was conducted. Thus, we can standardize the experimental processes and guarantee the appropriateness of the experimental setting. The participants read and signed an informed consent form before taking part in the eye-tracking experiment. The lab was reserved for one participant at a time.

The eye tracker was calibrated for each participant, which took approximately two minutes on average. After calibration, four pages were presented, having to perform on each page a purchase process task assigned in random order to avoid the learning effect. Participants' eye movement data were automatically recorded by the eye tracker. After viewing each page, subjects were asked to answer some questions. After the experiment, they were sincerely thanked, and each participant was given a monetary incentive of 20,00€. Data from four individuals were finally eliminated due to bad calibration, and the final sample consisted of the observations of 66 subjects in the four stores. We also follow the same procedure for detecting outliers as in Study 1 and discard 11 tasks performed by 11 participants.

4.4. Results Study 2

The structure of the presentation of the results of Study 2 is similar to that of Study 1. We analyze the importance of images compared to information about the product's name and information about the price. The first two columns in Table 5 (part A) show the average number of fixations on the web page before each AOI and the standard deviation of this variable. The fewer the number of fixations before an area, the sooner it attracts attention. The number of fixations in an area before an image (mean= 87.52) is lower than in the name (mean= 181.24) and price (mean= 153.9) areas, so individuals pay attention to pictures before other AOIs. The last two rows of Table 5 show the result of the ANOVA tests for this variable (F= 12.496, p = 0.000), confirming Hypothesis 1A as in Study 1, as the number of fixations before an image is lower than the number of fixations before the name or price. In this case, after the images, the price draws attention second and the product's name third. The result of this order of attention, images first, price second and product's name third, may be due to the design of the experiment itself. In Study 2, the purchase task consisted of individuals having to click on the product cheapest, that is, they were directed to look at the area of the prices.

The last two columns in Table 5 (part B), show the mean and standard deviation of the number of total fixations in each AOI, standardized per 10,000 pixels. In this case, total attention to name (mean= 6.38) is slightly less than attention to image area (mean=6.85). This may be because the product's name is very short and is also processed quickly. As we had anticipated, it is true that the total attention to the image (mean=6.38) is less than to the price area (mean= 13.23). An ANOVA on total fixations in one AOI reveals a significant main effect (F= 30.875, p= 0.000). In view of these results, we can partially confirm Hypothesis 1B. We cannot confirm that the processing of images is faster than the processing of names. Images and brand names are processed faster while prices seem to take longer to process.

Table 5: Fixations before AOIs and Fixations by 10,000 Pixels Study 2

	(A) Number of Fixations before element		(B) Total Fixations by 10.000px	
AOI	**Mean**	**Std Dev.**	**Mean**	**Std Dev.**
Image	87.52	151.13	6.85	7.85
Name	181.24	249.69	6.38	9.39
Price-cart	153.90	207.11	13.23	12.80
F value	12.496		30.875	
Pr(>F)	0.000***		0.000***	

*** significant at 1% level

To test Hypotheses 2A, we use the number of fixations on the web page before an image and compute the average values and the standard deviation of this variable considering the different tasks, product categories, product positions and gender of the subject (Table 6 - part A, first three columns). In addition, the last rows of part A of Table 6 correspond to the ANOVA tests for these variables. We expect that product images attract attention faster in the choice stage than in the purchase and postpurchase stages. Images attract attention slightly earlier in the purchase task (mean= 160.15), then the choice task (mean= 161.75) and significantly later in the postpurchase task (mean= 178.84). The ANOVA test reveals a significant main effect (F= 20.474, p= 0.000). The results show that there are no differences between the product choice and the purchase task, and that the hypothesis is only valid when the choice task is compared with the postpurchase task. Therefore, Hypothesis 2A is partially confirmed.

To test Hypotheses 2B, we compute the mean and standard deviation of the number of total fixations in each AOI considering the different tasks, standardized per 10,000 pixels, that can be observed in the upper part of Table 6 (part B). In addition, the last rows of part B of Table 6 correspond to the ANOVA tests. Images attract more attention when they are relevant to the task at hand, in the choice stage (mean= 47.02) and images attract less attention when they are not crucial for completing the task: when purchasing the cheapest product (mean= 13.40) or when locating product tracking information (mean= 21.17). Table 6 also shows that the task's total number of fixations is significant (F= 58.258, p= 0.000). Hypothesis 2B is confirmed: images attract more global attention for product choice than for the other tasks.

In addition to the task, Table 6 also shows the average and standard deviation of number of fixations on the web page before an image and total fixations in images considering the different product category and the position of the product on the webpage of the product considered. We also account for gender and age as control variables.

The main effect of the category is significant both in fixations before images (F= 8.523, p= 0.000) and in total fixations in images (F = 2.660, p = 0.047). Individuals look at images earlier in experience products (T-shirts mean= 165.29, Backpacks mean= 174.09, Study Chairs mean= 177.52) than in search products (Monitors mean= 220.67), although the total number of fixations on images is higher on monitors (mean= 36.56).

Regarding the position of the images in the stores, we detect a significant main effect of the product position in the number of fixations before images (F= 29.467, p= 0.000) but not in the total number of fixations (F= 1.492, p= 0.166). Images in the upper row (means= 78.79, 78.51, 170.93, 242.99) attract attention earlier than images in the second row (means= 247.6, 220.32, 251.86, 229.25). The product located third in the second row is the last to attract attention (mean= 251.86).

We find a significant effect of gender in the variable number of total fixations in the images (F= 7.200, p = 0.001) due to the difference in the very small group of subjects in the category "others". We also find significant differences for age groups (fixations before images (F= 5.922, p= 0.003) and total number of fixations (F = 3.483, p= 0.031). Images attract attention earlier for younger people, but elderly individuals overall pay more attention to them. Boardman and McCormick (2019) obtained a similar result: individuals between the ages of 20–30 had the quickest fixation durations on the product image, whereas those over 50 spent the most time looking at it. Thus, consumers in their 20s did not study the images for long.

Table 6: Fixations before Images and Fixations in Images by 10,000 Pixels (Study 2)

	(A) Fixations before images		(B) Total Fixations in images	
	Mean	**Std Dev.**	**Mean**	**Std Dev.**
Task:				
Site exploration	232.79	230.79	28.17	29.18
Product choice	161.75	161.67	47.02	40.62
Purchase	160.15	164.71	13.40	24.34
Postpurchase	178.84	211.08	21.17	37.68
Category:				
Monitors	220.67	215.41	36.56	40.76
Backpacks	174.09	150.33	25.00	31.31
Chairs	177.52	204.37	33.42	38.05
T-shirts	165.29	190.29	28.79	32.40
Product Position:				
Position 1	78.79	130.67	30.94	33.24
Position 2	78.51	125.46	38.54	43.09
Position 3	170.93	164.94	31.70	35.58
Position 4	242.99	214.61	30.84	32.67
Position 5	247.36	221.99	25.18	33.98
Position 6	220.32	196.70	31.56	40.56
Position 7	251.86	214.99	29.57	34.81
Position 8	229.25	166.49	30.81	33.76
Gender:				
Male	197.99	202.39	29.96	33.73
Female	177.84	190.00	30.51	33.53
Other / Not declared	180.31	177.21	46.88	65.83
Age:				
Less than 30	161.95	188.29	29.33	32.29
30-49	180.40	176.08	29.57	32.27
50 or more	213.66	215.18	34.90	43.38
ANOVA Test	**(A) Fixations before images**		**(B) Total Fixations in images**	
Variable	**F value**	**Pr(>F)**	**Variable**	**F value**
Task	20.474	0.000***	58.258	0.000***
Category	8.538	0.000***	2.660	0.047
Product Position	29.467	0.000***	1.492	0.166
Gender	0.290	0.748	7.200	0.001***
Age (Quantiles)	5.922	0.003***	3.483	0.031**
Task*Category	1.561	0.122	2.013	0.035**
Task*Product Position	1.199	0.243	0.823	0.693

* significant at 10% level
** significant at 5% level
*** significant at 1% level

To test Hypotheses 3A and 3B, it is necessary to observe the interaction effect of the task (choice) and the category in the attention to the images in Figure 6. Panel A in Figure 6 shows the interaction effect of task and category for the variable number of fixations before images. Images attract attention faster in the choice stage in experience product categories (backpacks, study chairs and t-shirts) and they attract much less attention in the search category (monitors), where the product description is more useful for making product choices. These results lead us to confirm Hypothesis 3A: images attract attention faster in the choice stage in experience product categories than in search product categories.

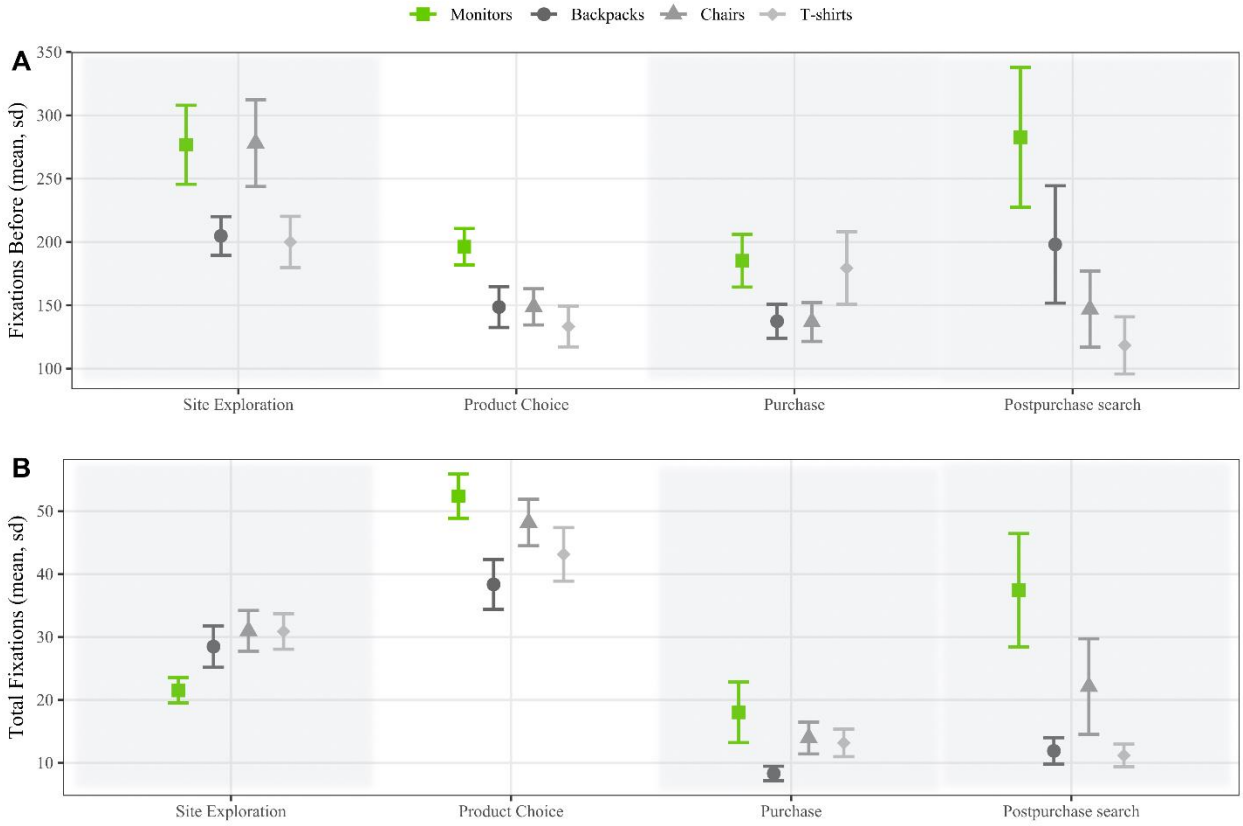

Figure 6: Interaction Effect of Task and Category in Attention to Images (Study 2)

Panel B in Figure 6 shows the interaction effect of task and category for the variable total fixations in images. Results in Table 6 show that this interaction effect between task and category is significant ($F = 2.013$, $p = 0.035$). However, the direction of the interaction effect is contrary to that expected. Images seem to be more important for choice of monitors than for backpacks or t-shirts. No significant difference is found between monitors and chairs. In this case, images attract more attention for search categories in product choice. Specifically, images seem to be more important for the monitors in the choice, an effect not anticipated. Therefore, Hypothesis 3B is rejected in Study 2.

5. Discussion

Table 7 presents a summary of the result of the hypotheses raised in study 1 and 2. This table shows that of the six hypotheses proposed, two have been confirmed, another two partially and another two rejected.

Our results confirm both in Study 1 and in Study 2 that images attract attention faster than textual elements. However, there are differences in which item is fixed in second place. Specifically, in Study 1, the second element that first attracts attention is the name of the product, while in Study 2 it is the price. Precisely, the purchase task in Study 1 consisted of adding a certain model to the cart and in Study 2 it was necessary to add the cheapest product. Our research design can therefore explain this result.

Table 7: Summary of Hypotheses Testing

Hypotheses	Results	Comment
H1A: Product images attract attention faster than brand name and product price in the product area.	Confirmed	Accepted in Study 1 and Study 2: images attract attention faster than textual elements
H1B: Product images attract less total attention than brand name and product price in the product area.	Partially confirmed	Images attracts less attention than brand names confirmed in Study 1, not significant differences in Study 2 Images attract less total attention than prices in Study 1 and Study 2
H2A: Product images attract attention faster in the choice stage, when they are relevant to the task, than in the purchase and postpurchase stages, when they are not.	Rejected	Rejected in study 1: attention to images is faster in purchase and postpurchase tasks. Not significant for purchase task in Study 2, accepted for postpurchase task in Study 2
H2B: Product images attract more total attention in the choice stage, when they are relevant to the task, than in the purchase and postpurchase stages, when they are not.	Confirmed	Accepted for study 1 and study 2
H3A: Images attract attention faster in the choice stage in experience product categories than in search product categories.	Partially confirmed	In study one confirmed for all categories but ball-point pens In study two confirmed
H3B: Images attract more total attention in the choice stage in experience product categories than in search product categories.	Rejected	Only accepted for the differences with ball point pens in Study 1. Rejected for backpacks and t-shirts in study 2. Not significant differences for mobile phones (Study 1), hard disks (Study 1) and chairs (Study 2)

Also, in both studies, it is found that prices attract more total attention than images. These results show that numerical information is more difficult to process, takes more time and that is why the number of total fixations is greater in both studies. Authors like Rayner et al. (2001) and Hernández-Méndez & Muñoz-Leiva (2015) showed that the participants in their experiment spent more time looking at text than at the image. Our results in Study 1 and 2 pointed in the same direction with the specific textual information of products' prices. Consumers' response to price stimuli could involve, in addition to attention, comprehension, retention, and recall (Jacoby and Olson, 1977). In the second study, we cannot confirm that images attract less total attention than product names. This can be due also to our research design, more focused on prices for the purchase task in Study 2.

When consumer goals are taken into account, they influence attention. However, we find a different result to that expected in the case of the attraction effect. Images attract attention faster at the purchase and post-purchase stage, rather than at the product choice. This may be due to the targeted nature of the purchase and post-purchase tasks in our design for Study 1 and Study 2. The purchase and post-purchase tasks are concrete and give a greater sense of urgency in their execution than the choice of product. Being focused and directed tasks, individuals go more quickly to the product area and observe not only images, but the three elements (images, names and prices) faster than for the choice and exploration tasks. We have conducted two robustness checks in order to test this explanation. First, we have computed the mean number of fixations before prices and product names for the different tasks in Study 1 and 2, and they are indeed lower for purchase and postpurchase tasks than for exploration and choice tasks for all categories in Study 1 and 2. Secondly, we have excluded the purchase task for the analysis ANOVA in Study 1 and 2, to test for

the possible effect of the change in the design for the purchase task between studies and we obtained similar results. In future studies, it would be convenient to explore new measures of attraction that could distinguish these confounding effects. As stated in Hypothesis 2B, both in Study 1 and in Study 2, we confirm that images attract more total attention in the choice stage, when they are relevant to the task. Attention to product images is the choice task is more than two times the attention in the purchase tasks both in Study 1 and 2. Also, the attention to images in the purchase stage is 176% higher in Study 1 and 203% higher in Study 2 to the attention to images in the postpurchase task. This result has not been previously tested in the literature. Although we didn't have any specific hypothesis about this effect, the attention to images is also higher in the choice stage than in the exploration task, when product images are also relevant.

Finally, comparing the importance of product images in search and experience product, images attract attention faster in experience products (sport shoes in Study 1 and backpack, t-shirts and chairs in Study 2) than for search products (mobile phones, hard disks in Study 1 and monitors in Study 2) but this effect is not consistent with the results for ballpoint pens that attract attention faster in Study 1. Regarding total attention to images, we obtained mixed results, as there are not significant differences between sport shoes, mobile phones and hard disks in Study 1 nor between monitors and chairs in Study 2, and the attention to images in backpacks choice (an experience product) is lower than in monitors choice. We conclude that there are differences in the attention to product images (both in terms of speed and duration) between product categories but these differences are not attributable to their search or experience characteristics but to other differences. For example, ballpoint pens are rarely bought online by our subjects (only 3% of them have purchased them online). Ballpoint pens are small objects, cheap and tend to be easily lost, so they are renewed with some frequency before the product is consumed (less use of the image in the choice, the price will be more relevant). The category also involves a lower level of risk than the other three categories and, therefore, a lower level of our subjects' involvement. Monitors in Study 2 are within the search product classification, but they also imply a higher level of risk and involvement with the purchase of the product (Dholakia, 1997). They are expensive objects and remain visible in a space being part of the decoration of a room and their appearance can influence their choice.

6. Conclusions, Future Lines of Research, and Limitations

In this study, we use the Visual Marketing Attention model proposed by Wedel and Pieters (2008) and Stimulus-Organism-Response (S-O-R) model proposed by Mehrabian and Russell (1974) as an integrated theoretical framework for understanding the effect of product pictures on B2C websites.

First, consistent with previous studies, we observed how product images attract attention more quickly, as they are observed before other information (Adaval et al., 2018; Hernández-Méndez and Muñoz-Leiva, 2015). We also obtain robust results regarding the position of the images in the online stores. Images in the upper row and the left side attract earlier attention than images in the second row and the right side of the page. The image in the second position of first row and the third product in the second row attract more attention and the first and second images in the second row attract less attention. Preliminary research suggested that the central area of the screen encompasses the majority of visual attention (Brasel and Gips, 2008; Goldstein et al., 2007). We have confirmed that product pictures attract less attention than the product name and the price information. Authors like Rayner et al. (2001) and Hernández-Méndez & Muñoz-Leiva (2015) showed that the participants in their experiment spent more time looking at text than at the image.

Also, the importance of product images is not independent of consumers' goals in the two studies. We show how more time is devoted to images, more attention is paid to them when relevant for the task at hand, in our case, product choice and, to a lesser extent, when locating a product by name or price and when looking for tracking information. In short, images attract more global attention when individuals are immersed in the task of choosing the product in their purchase journey than for other types of tasks. Contrary to what we had predicted, in both studies, we obtain that when individuals make purchase and postpurchase tasks, they put their attention first on the product images. One would expect that for this type of task, individuals would first pay attention to the textual information, which is essential for fulfilling the task. However, having to carry out directed tasks seems to lead individuals to focus on the product area in the first place. In a future paper, it would be convenient to consider the fixations before the product area variable to test the hypothesis about product images attract attention faster in the choice stage than in the purchase and postpurchase stages.

We have also studied the differences between product categories. We find a complex interaction effect of task and category, not simply related to search or experience categories or the level of risk. Therefore, we cannot confirm that images attract more attention for all experience categories in product choice, and the conclusions are specific for each product category. For example, in study 1, there are significant interaction effects of task and category in the speed of attention to product images. For choosing sports shoes (experience), individuals look first at the images in

front of the search products like phones and hard drives. This effect is not significant in ballpoint pens. In study 2, for choosing experience products (backpacks, chairs, t-shirts), individuals look first at the images in front of the monitors (search). This is a very significant result because it highlights the importance of images in experience products to provide information initially through the sense of sight. However, this information is less necessary when it comes to search products.

Also, in study 1, we find an interaction effect of task and category in the total attention to each AOI. This effect is not significant in mobile phones and hard disks. Thus, this effect is mainly due to the minor use of images in product choice for the ballpoint pens. Buying ballpoint pens involves low level of risk and involvement. Pieters and Warlop (1999) find images to be more important when the motivation is higher. Previously, other authors had observed differences in attention to print advertising images according to the involvement with the category (Pieters and Wedel, 2004; Singh et al., 2000).

In study 2, the interaction effect of task and category is significant in the opposite direction. Monitors (search) require full attention to images more than experience products (backpacks and t-shirts). This effect is not significant in chairs. Thus, this effect is mainly due to the increased use of images in product choices for pc monitors (search). It is probably due to the computer screens are technological products in which visual design is important in a similar way to a television. In Study 1 mobile phones require similar total attention to images than sport shoes. It seems that in technological products the importance given to design and aesthetics is not typical of search products.

Therefore, more research, with a higher number of categories, will be needed to confirm the pattern of the attentional process to images across shopping tasks and product categories. Our data do not allow us to discern the relative importance of purchase habits and category risk in these results, but this is a potentially fruitful area for future research.

Finally, in our second study, we have obtained that age impacts the way that consumers respond to online product presentation and shows that retailers' targeting different age groups should consider this when investing in their product presentation features. Younger people (under 30 years of age) notice the images first, and those over 50 years of age spend longer looking at pictures and less time assessing the text areas. These findings show that age is an important factor to consider in website design studies, particularly with the aging population and increasing number of older people shopping online.

This study has focused on the presentation of product images in a basic format as the simplest means to overcome the intangibility of online products. However, this first research step could be extended to other types of presentations to see more details and provide more information about products such as 3-D images and zooming technology (Boardman and McCormick, 2019) or olfactory scenes (Flavián et al., 2021; Krishna et al., 2014) in the future. In addition, the image size factor could also be considered. Research on online shopping has shown that the size of the image is positively related to generating favorable affective and cognitive attitudes and higher purchase intentions (Kim and Lennon, 2008).

Our study provides valuable evidence of differences in product images' importance due to factors such as the purchase task and the product category. In the introduction, we question the usual retailers' fixed image layouts strategy. Our results show that using a fixed layout for product information could not be optimal. These differences are an opportunity for e-retailers to implement technological solutions tailoring the experience on the webpage, optimizing customers' experience, and gaining competitive advantage.

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