

ATMOSPHERICS: EFFECT OF WEBSITE COLORS ON THE EVALUATION OF UTILITARIAN AND INFORMATIONAL FEATURES OF ELECTRONIC PRODUCTS

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Abstract

Objective: to verify the effects of atmospherics of a cool color (i.e., blue) and warm color (i.e., orange) on consumer behavior patterns when evaluating a product. Method: The sample consisted of 90 participants divided into three groups according to the background color of the site. Participants evaluated five products from a video call, and after that, they judged affirmatives. Time was also counted. Results: The blue group obtained the highest informative and utilitarian averages, and there was a high correlation between the informative and utilitarian items and purchase intention, showing that the conditions attached to a product's social status are directly linked to the economic and functional benefits it has and to the motivation to buy. The orange group performed the task with more difficulty, as they took a significant amount of time, so it became an aversive task. The linear regression analyses showed that factors related to the subject's self-esteem when purchasing a product are more determinant than the product's functionality. Originality: The general predictions

of the BPM held up despite the color variation, but differences in the measures were still found when analyzing each product individually between the groups.

Keywords: atmospherics; colors; behavioral perspective model.

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INTRODUCTION

It is well-known that individuals are subject to various visual stimuli as they interact with the consumer behavior setting. These stimuli can be perceived when an individual enters a supermarket, or a store, and are surrounded by products with various colors and different packaging styles (Peck & Childers, 2008). The visual characteristics of products can be arranged to encourage consumer behavior. In this sense, it is considered that the perception of visual stimuli is a continuous process that is not limited to the moment of purchase, as the consumer enters in contact with the product through this kind of stimulus and creates their need for consumption long before carrying that act (Solomon, 2016).

Concurrently, one of the factors that can influence this type of behavior are cultural values, as it is from them that advertisements will be developed and, consequently, will create a positive identity for a particular group of consumers. Therefore, to enhance these effects, companies and enterprises try and seek new ways to encourage this practice by exploring new ways to present products, seeking new opportunities, and getting to know their customers better. Consequently, this conduct promotes competitiveness among companies, and this is one of the causes of the consumerism seen in present society (Menezes, 2010).

In this context, one of the techniques used by Marketing to stimulate consumption through visual stimuli is the use of atmospherics, which directly influence the environment and can alter consumer behavior. This makes the location more appealing for consumption, increasing the individual's interest in a particular product and, consequently, the likelihood of purchase behavior. Atmospherics can be characterized by factors such as lighting, layout, color, and other elements that make up the space (Kotler, 1973). Therefore, studies related to the variables are essential, as the consumer's behavioral patterns can be shaped by their initial perceptions of the elements that constitute consumer setting. Therefore, the consumer's desire to purchase a particular product may become increasingly intense, as the atmospherics elements, such as visual stimuli, alters the individual's awareness of their need for consumption.

Theoretical Framework and Literature Review

The e-commerce, brought about by the advent of the internet, has streamlined the world of commerce, offering people the opportunity to engage in buying and selling products, both large and small, with remarkable dynamism. With each passing day, this form of commerce is gaining increasing prominence, thanks to its potential to outperform traditional in-person sales. Moreover, e-commerce serves as a vital tool for small-scale entrepreneurs, enabling them to reach a broader customer base, an accomplishment that would be challenging to achieve through a physical storefront. The types of service-oriented websites within this virtual realm can be tailored to suit the preferences and needs of various consumer groups. In this regard, e-commerce simplifies transactions for consumers and enables them as instantaneous (de Mendonça, 2016).

As of 2012, a new form of business known as a "marketplace" was established. This type of commerce streamlines the search for products of varying prices and qualities by bringing together different brands in one centralized location. Consequently, it offers a service that prioritizes convenience and ease, as it eliminates the need for physical travel and simplifies the decision-making process for both consumers and sellers when choosing a product (Ribeiro & Freitas, 2021).

Based on these principles, it is possible to understand that multiples factors can influence the online shopping environment. Demographic variables, such as age, gender, family structure, social class, ethnicity, and lifestyle, play a significant role when it comes to purchase intention. Additionally,

internal variables, such as perceptual processes, personal needs and cultural influences can be relevant to consumer behavioral patterns. (Solomon, 2016).

Lucchese and Ribeiro (2011) assert that consumer behavior is driven by emotional processes and thoughts established through a purchasing situation. In this regard, it is evident that the environment in which the act of purchase takes place can have a profound impact on consumer's choices. Furthermore, elements such as advertising, the type of media, the information available, are relevant influences on the purchasing decision. Furthermore, the perception of a given product can be altered as a function of how it is presented. Thus, with the recent changes in online consumption, such as e-commerce, these changes should be emphasized, as they are reshaping the traditional consumption patterns by enabling instant purchasing, offering a different perception of products, and allowing more autonomy for consumers to shop through multichannel retailing (Janakiraman et al., 2018).

It is also noted that the consumer behavioral patterns of an individual are established in a cultural context along with other aspects of their lives. Thus, psychological processes are synchronized with the culture in which he is immersed, and, therefore, directly influencing consumption behavior. That is apparent when comparing individualistic versus collectivist societies, as consumer behavioral patterns can vary greatly, and different advertising approaches are used to influence purchase intent (Reis Junior & Torres, 2018).

According to Menezes (2010), psychological demands stem from a lack of recognition, value, or social integration. Therefore, personal consumer choice is determined by their situational awareness of the setting. From this perspective, environmental factors play a crucial role on consumption behaviors since various local elements can be manipulated. Thus, it can be observed that the atmospheric effects of the consumer environment can be manipulated to create a situation favorable to purchase behavior, as it fosters a positive perception on the consumer.

Thus, it becomes increasingly evident that humans are living in artificial and easily manipulable environments. Consequently, Marketing will leverage these techniques to influence the marketplace environment, in which, as consumers as purchasing, they will firstly perceive the environmental variables, even before the product itself. As such, the consumption behavior environment (i.e., location), is one of the most significant and influential characteristics to predict purchase intent (Kotler, 1973).

In this sense, as Kotler (1973) states, the consumption behavior environment is shaped by various factors such as lighting, layout, aroma, music, and others. This set of attributes and environmental characteristics are referred to as *atmospherics*, and they can be more specifically understood as the effort made by professionals to manipulate shopping environments (i.e., point of sale) and thus evoke specific emotions that can impact a consumer, increasing the likelihood of purchase behavior in that given setting.

Given this perspective, e-atmospherics can be used as a market strategy to influence on-line consumer behavior, and that's particularly relevant as the virtual environment has been gaining prominence as an alternative for purchasing. Additionally, many brands on this strategy due to its cost-effectiveness, allowing them to allocate more resources for customer engagement (cf. de Oliveira et al., 2019; Wilson et al., 2019). Loureiro and Roschk (2014) also emphasizes that e-atmospherics interventions can encompass various graphic design elements, such as colors, layout, and style, which are directly integrated with other general components that make up a website. Moreover, they can also involve informational design, which includes the most pertinent information during the purchasing process, such as displayed prices, help buttons, and others. Thus, these two design aspects can be found in virtual shopping environments.

Marketing gains prominence by focusing on building awareness and interest in the relationship between consumers and companies. As this relationship draws nearer, consumers are increasingly more exposed to digital marketing. In this sense, the emergence of Marketing 4.0 can be directly connected to the strategies that combine both digital and traditional marketing. In this context, it seeks to achieve higher customer engagement, consequently fostering increased interaction both online and offline as it employs both virtual and in-person means to strengthen customer engagement (Kotler, 2021).

With the objective of further exploring the study of the effects of atmospherics, originally proposed by Kotler (1973), this line of research can benefit from different methodological e theoretical approaches. In this sense, the Behavioral Perspective Model (BPM) (cf. (Foxall, 1990, 2002, 2010, 2016)) can contribute with this line of research. This is particularly relevant considering a relatively new phenom such as e-atmospherics, considering that the BPM model for the investigation of individual differences in consumer behavior focusing on contextual variables (e.g., Cavalcanti et al., 2013, Oliveira-Castro et al., 2016). Furthermore, there are already previous research based on this theoretical model regarding atmospherics (cf. Ferreira, 2007).

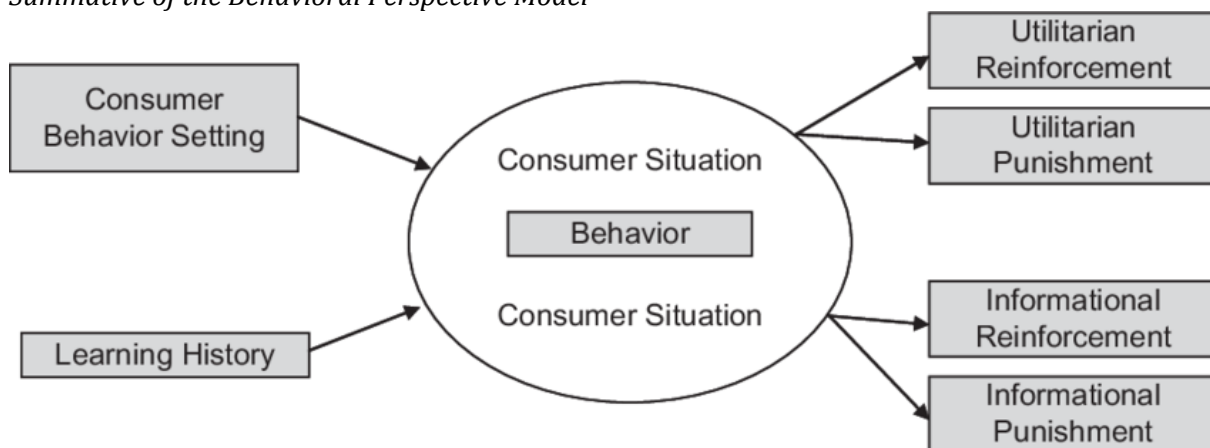
The BPM was developed by Foxall (1990, 2002, 2010, 2016) as an alternative for classical social-cognitive models (e.g., Solomon, 2016) that tends to emphasize mental end internal variables. This model is based on the principles established by the Experimental Analysis of Behavior (cf. Skinner, 1974), and, as such, presents a focus on learning history and contextual variables, both antecedents and consequences, and to explain and predict behavior.

One of the core premises of Behavior Analysis is that the behavior of individuals (i.e., operant behavior), has its frequency and probability of occurrence determined by its consequences. Given this, it is assumed that reinforcing consequences (i.e., reinforcers), increases the probability of occurrence and frequency the behavior that precedes it, while an aversive or punishing consequence (i.e., punishers), diminishes it (cf. Pierce & Cheney, 2017).

In this context, the BPM, as an adaptation of the classical operant model (cf. Skinner, 1974), seeks to understand how environmental factors can determine consumer behavior patterns in the marketplace. Therefore, one of the most important aspects for this perspective is that the consumer behavior patterns, such as purchasing, search or evaluation, occurs in the intersection between the learning history in a particular category consumption, and contextual variables, which are the consumer behavior setting and the environmental consequences (Foxall et al., 2011). Figure 1 presents a summative model of the BPM summarizing its most important variables, as it is displayed, it has some adaptations in innovations in comparison with the operant model to better investigate the specific variables concerning the various categories of consumer behavior patterns.

Figure 1

Summative of the Behavioral Perspective Model



Source: Foxall (2010, 2016)

One of the innovations proposed by Foxall (2010, 2016) through the BPM refers to the classifications given to reinforcing and punishing consequences of behavior. In this regard, consumer behavior is influenced by two broader categories of consequences: Utilitarian and Informational.

Utilitarian consequences refer to the physical characteristics, overall utility and functionality of a given product or service (Foxall, 2010, 2016). One example of utilitarian reinforcement can be verified on electronic products with additional utilities and applications, and punishment when those utilities don't work properly or degrade the product.

As for Informational consequences, those are directly related to social status and prestige. That is, what are the social feedback, hence informational, that the consumer gets back from his social context through the consumption of a particular product or service. (Foxall, 2010, 2016). Informational consequences are directly tied to brand. In this sense, products with famous and brands are related to higher informational reinforcers. On the other hand, products from undifferentiated or inexpensive brands can even be associated to informational punishment, depending on the social context.

Cavalcanti et al. (2013) investigated individual differences on consumer behavior on fast moving consumer goods. In their study it was observed that these types of reinforcement can be influenced, for instance, by the brand, especially when it comes to informational reinforcer and punishers. It was also verified that individuals exhibited significant demand elasticity, paid higher and exhibited consistent patterns of consumption related to brands in the same informational level. In addition, the results indicated that an individual's prior purchasing history on a given brand can lead to changes in the consumer behavior patterns, when it comes to brand. These findings are further explored in (Oliveira-Castro et al., 2016), which provides added robustness to such evidence through an analysis based on the establishment of a utility function (cf. Varian, 2010) to describe these consumer behavior patterns in a more comprehensive way.

Other important concept proposed by the BPM is that of consumer behavior setting (see figure 1). It represents the blended effects of economic systems and contextual antecedent variables that can influence and shape the consumer behavior, such as discriminative stimuli (S^D), which have the function of evoking a given behavior that have been previously reinforced in its presence. This concept also encompasses Motivating Operations (MO), that are variables that can alter the functions of environmental consequences and of S^D s, by adding extra inhibitory or evocative power to those stimuli (Foxall, 2010, 106).

From this perspective, the consumer behavior setting can be classified as open or closed, varying in degrees of openness or closure in a continuous fashion. Open settings are characterized by a significant degree of variability among the variables present in the environment. In this type of scenario, there are different stimuli influencing consumption and more alternatives for consumption, which grants the buyer more autonomy in his behaviors, such as purchasing. In contrast, in closed settings, consumption responses are controlled and, therefore, limited. In this way, environmental variables and purchasing options are predetermined, which restricts consumer independence (Nalini et al., 2013).

In this sense, the concept of consumer behavior setting is a useful framework to establish a BPM based perspective on atmospherics, as it directly refers to the effects of several contextual variables on consumer behavior (Wells & Foxall, 2011). This was also stated by Ferreira (2007) emphasizing that atmospherics effects are present in the consumer situation, and can be interpreted as function altering stimulus, as it changes the way certain antecedent variables can influence the behavior. As such, atmospheric variables are not S^D s or MOs per se, but can make those more effective in influencing consumer behavior patterns.

Therefore, the colors used in a retail environment can be categorized as atmospherics effects that can influence purchasing behavior, particularly in a closed setting. It is important to note that the meaning and perception of color vary for each culture (Verma & Prashar, 2017). In this context, consumer behavior can be altered depending on the predominant hue in the environment (Golnar-Nik et al., 2019; Kim et al., 2020; Modi & Singh, 2023). The following studies demonstrate how the variance between warm and cool colors affects the perception of a product.

Putri and Balqiah (2017) conducted a study on e-atmospherics, in which was investigated the influence of colors on website visits. They employed two factors: the product image, which could include a model wearing the item or not, and the color used on the website, which could be a cool color (blue) or a warm color (green). Additionally, there are other variables that can influence consumer behavior, such as content, products, and product information available on the website. Based on these variables, four different websites were created. The results showed that consumers felt more comfortable making purchases when a human model was present. Furthermore, the higher the emotional level when accessing the website, the more positive the attitude. Thus, individuals are more

motivated to make a purchase. The more comfortable people feel when making a purchase, the higher the likelihood of returning to the site.

The study conducted by Ettis (2017) sought to verify whether there is a change in consumer behavior on a shopping website when the subject is under the effect of a certain background color. The experimental conditions chosen used the colors blue (i.e., cool) and yellow (i.e., warm). The results showed that the blue color has greater influence on pleasure and concentration than the yellow color. As for purchase intent, it was equivalent in both conditions. Finally, concentration was influenced by the number of pages visited and the time spent on the website visits (Ettis, 2017).

OBJECTIVES

Given previous empirical evidence and the prevalence of online shopping, particularly driven by the COVID-19 pandemic (cf. Gu et al., 2021), it becomes increasingly relevant to study how elements present on websites can influence consumer behavior. Thus, the present study aimed to verify the impact of website colors, specifically a cool color (i.e., blue) and a warm color (i.e., orange), on consumer behavior patterns of evaluation for electronic products. Specifically, it was investigated whether the assessment of features related to informational and utilitarian reinforcers associated with these products is influenced by the website colors (i.e., behavior consumer setting). Finally, other behavioral patterns were assessed, including task completion time, price estimation, and purchase intent.

METHOD

Participants

The research included 90 participants who met the inclusion criteria and were aged between 18 and 60 years ($M = 23.5$, $SD = 6.69$). Approximately 65% of the participants identified as female, 72.2% had incomplete higher education, 58.9% had a monthly income of 6 or more minimum wages, and 73% of the participants shopped online occasionally and frequently. The participants were divided into the white, blue, and orange groups, with 30 individuals selected for each group.

Additionally, since this study involves color visual acuity as a relevant factor, individuals with color-related visual impairments, such as color blindness and achromatopsia, were not included in the sample. The colors viewed during the test could vary depending on the operating system, monitor, graphics card, and browser used (cf. Ettis, 2017). For this reason, only Google Chrome browser users were selected to minimize these potential interferences and uncontrolled variations. Participants were also required to have a minimum download speed of 10 Mbps to avoid disruptions during the research process.

Setting

The experiment was conducted via video conference and took place in a controlled environment to control extraneous variables. Participants were asked to be in a space with a chair and a table to support their electronic device, enabling them to view the online form. Additionally, it was required from the participants that the ambient sound in the chosen environment was balanced to ensure that participants felt comfortable and were not distracted during the application. It was also asked that natural or artificial lighting to be kept consistent. It is important to note that there were no dialogues or interruptions during the procedure. Following similar criteria as outlined previously, the researchers' environment included a chair and a table to support the laptop, stopwatch, and clipboard.

Materials

A shopping simulation website was created by a software engineer and the researchers using a cloud computing service platform provided by Amazon (<https://aws.amazon.com/pt/>). The developed code was stored on the Github hosting platform (<https://github.com/danielmarquesr/colors-web>). The website included information about five products, each with photos and descriptions. On the site,

there was a link that directed participants to a Google Form that should be opened after viewing the website. Thus, there were a total of five forms.

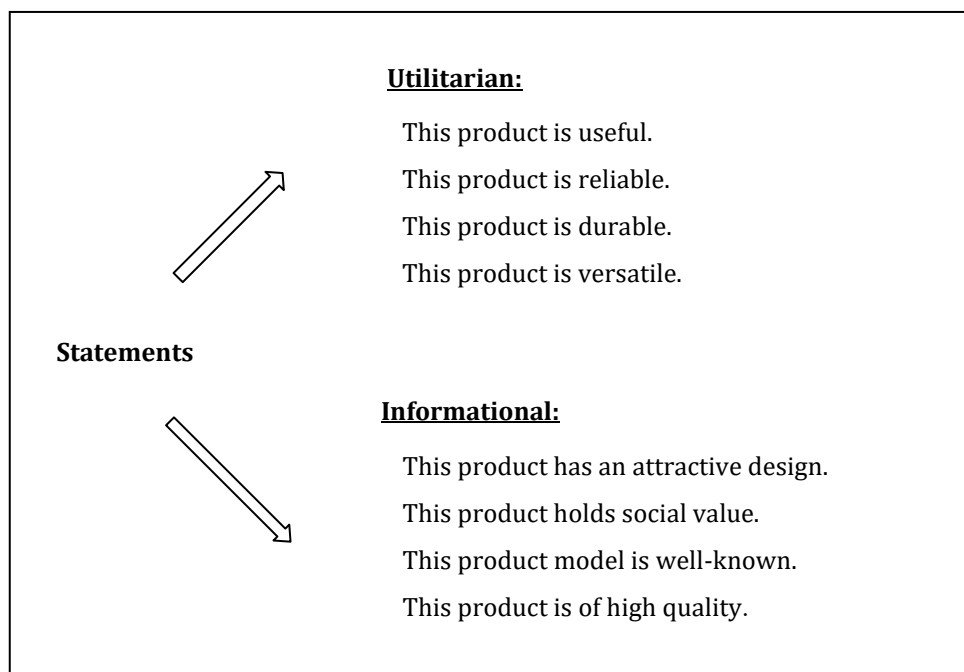
Using the Google Forms platform, participants were required to respond to a product evaluation questionnaire. Additionally, a form was provided at the beginning of the experiment containing the Informed Consent Form (ICF) and for collecting sociodemographic data. The evaluated products included a tablet, smartphone, notebook, smartTV, and smartwatch.

Thus, participants were required to read the statements and evaluate their perception of the products characteristics. The statements were formulated using a Likert-type scale ranging from 1 "completely disagree" to 10 "completely agree." These statements addressed the eight distinct attributes.

A more detailed description of the questionnaire composition and its implementation can be found in the "Product Evaluation" procedure section. It is important to note that the last two questions in each form pertained to purchase intent, where the participant had to assess the statement "I would buy this product" in a similar fashion as before. Figure 2 presents the statements included in the questionnaire.

Figure 2

List of Statements Employed in the Evaluation Questionnaire



Source: Research data

Three versions of this form were employed, each one intended for one of the experimental groups. Following the study by Putri and Balqiah (2017), colors were selected based on the Munsell color system and converted into hexadecimal codes used in the HTML color chart of the website used to create the form. Thus, the selected colors were orange (hexadecimal code #FF8C00), blue (hexadecimal code #00C3FF), and white (hexadecimal code #FFFFFF) for the control condition. Figure 3 provides examples of the colors used and the layout of the three versions of the websites.

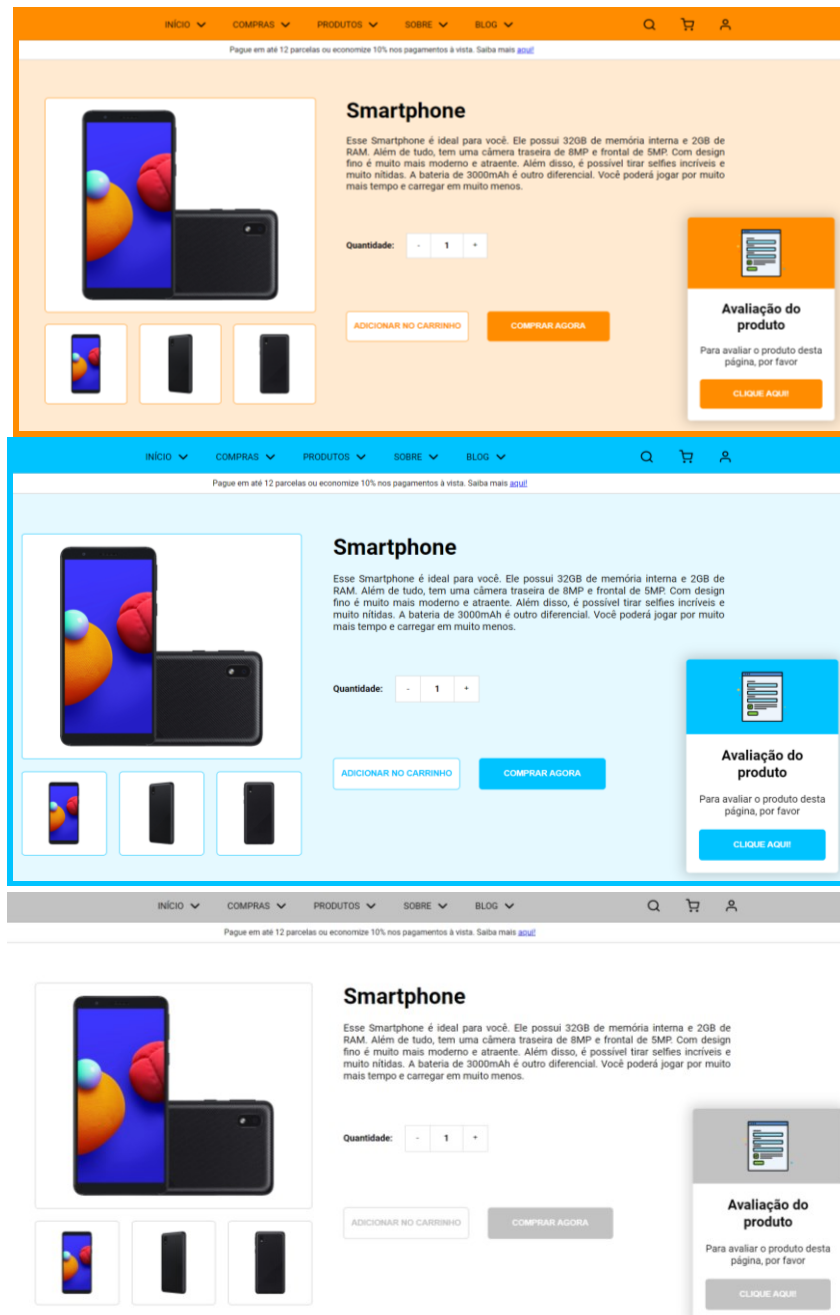
Additionally, a registration form and a mobile phone chronometer app were also employed to obtain the total response time and time per question for each participant during the questionnaire execution. Lastly, the Informed Consent Form (ICF) was prepared through Google Forms.

Procedure

The research was submitted to the Ethics Committee and received Approval No. 5,128,242 CAAE Nº. 52846321.7.0000.0023. After approval, the experiment was initiated. The recruitment was carried out through social media platforms such as Instagram and Twitter, using posts and shares inviting people to participate in the experiment. Following this outreach, individuals who expressed interest were formally invited and presented with the Informed Consent Form (ICF) on the day of the test. Once consent was obtained, the experiment began.

Figure 3

Website Layouts for the groups, orange (#FF8C00), blue (#00C3FF), and white (#FFFFFF)



Source: Research data

The experiment was conducted with three groups and consisted of a single phase, which involved completing a product evaluation questionnaire as depicted in Figure 2 that could be accessed

through a link in the bottom-right corner of the simulated website, as can be seen in Figure 3. Each group was required to complete a questionnaire, with the only distinction being the background color. The division was made based on the selection of the colors orange (#FF8C00), blue (#00C3FF), and white (#FFFFFF). Each color predominated in one of the forms and websites. Therefore, the manipulated independent variable were the color of the website and forms, and the dependent variables were the evaluation of the characteristics of each product and the time taken to complete the task.

The three groups were randomly composed, each consisting of 30 individuals. The experiment was conducted individually, because it was necessary to register the time to complete the task and to further control possible interferences. The participant was in a room alone with a chair and table for video calling. Next, a link to the Informed Consent Form (ICF) was sent to the participant, and following the assent, the experiment began. It is important to note that a prior drill task was to ensure the participants understood how to interact with the website and forms and to address any questions.

Thus, the following instructions were presented: "First, you will click on the link that I will send as soon as I authorize it. You will be directed to a website. On the site, you will find some information about the product, and you should read carefully and view each of the photos. After doing this, you should click on the bottom-right corner of the screen indicating the product evaluation link. Then, you will be taken to a form where you should judge the statements on a scale from 1 to 10, where 1 would be 'strongly disagree,' and 10 'strongly agree.' It is important to remember that you should judge as if you were the first person evaluating the product, and that you should also use all the information displayed on the website. If you have any questions, you can ask them at this moment. Once you start, you cannot ask any further questions."

Product Evaluation

When the timer started, each participant had to click on the provided website link and complete a questionnaire consisting of ten questions. The questionnaires were divided for each of the five products. It is essential to emphasize that, to control biases regarding the order of presentation, the items were organized randomly for each questionnaire.

Following these criteria, participants were instructed to rate the product statements on a Likert scale ranging from 1 to 10 for eight characteristics, with 1 being "strongly disagree" and 10 being "strongly agree." Four of the statements pertained to attributes related to informational reinforcers (1) appearance; (2) prestige/social status; (3) influence; (4) quality. The other four statements regarded utilitarian reinforcement: (1) functionality; (2) reliability; (3) durability; (4) versatility.

Additionally, participants indicated their purchase intent using two questions: one on the same scale as the previous statements and another as a multiple-choice to indicate the inferred price for the product. After completing the product evaluations, the timer was stopped, and the total time recorded. It should be noted that the price options were calculated based on the average prices of three of the most well-known e-commerce websites in Brazil, (e.g., Americanas.com, Magazine Luiza, and Submarino).

Data Analysis

Five measures were obtained from the participants' responses: (1) Informational Level; (2) Utilitarian Level; (3) Purchase Intent; and (4) Deviation Percentage, referring to how much the price inference given by the participant, deviated, in percentual value, from the product original price. These measures were calculated for each of the five products and were also considered collectively, resulting in a general measure (e.g., Overall Informational Level). As for (5) Time, this was registered only one time, employing seconds.

Therefore, both descriptive and inferential analyses were conducted. Descriptive analyses aimed to identify measures such as the mean, standard deviation, and the distribution of the obtained measures.

Regarding inferential analyses, intergroup (i.e., between groups) analyses were performed. These allowed to assess the effect of color on the participants evaluation behavioral patterns. Consequently, data from the three groups were compared for every measure obtained in the evaluation test. This analysis was conducted using an One-Way Analysis of Variance (ANOVA) (cf. Field, 2009), followed by a Tukey post hoc test to determine if there were significant differences associated with the independent variable (color hue). Lastly, correlation (Pearson) and linear regression analyses were performed. Those have the objective to further explore the relation between the variables.

RESULTS

Three tables were created to represent the overall scores assigned to each of the groups regarding the five measures. These measures were examined based on the scores assigned to five products, namely: (1) smartphone; (2) gaming notebook; (3) smartwatch; (4) tablet; and (5) LED smart TV.

Table 1 presents the results for the Orange Group in terms of the Informativeness Level, Utility Level, and Percentage of Deviation for the products evaluated by the participants. The Orange Group had the lowest overall mean when compared to the other groups, with scores of 7.75 for informational level and 7.59 for utilitarian level. Furthermore, the deviation percentage from the real value was the lowest among the groups, at 0.28%. The average time used by the group was 524.23 seconds, making it the group with the highest average time, and the average purchase intention was 4.93.

Table 1

Descriptive Measures Obtained for Informational Level, Utilitarian Level, Deviation Percentage (%), Time (in Seconds) and Purchase Intent for the Orange Group

Measure	Mean	SD	Minimum	Maximum	Range
Informational Level	7.75	1.25	4.75	9.40	4.65
Utilitarian Level	7.59	1.07	5.25	9.05	3.80
Deviation Percentage	0.28	10.94	-25	25	50
Time (s)	524.23	164.47	304	1045	741
Purchase Intent	4.93	1.32	1.67	7.17	5.5

Source: Research data

Table 2 presents the descriptive analyses for the Blue Group. As displayed on the table, it is possible to verify that the informational level mean was 8.17, the utilitarian level mean was 8.15, indicating equivalence in scores between those attributes. As for the purchase intent. it was 5.26, which was the highest among all groups.

Table 2

Descriptive Measures Obtained for Informational Level, Utilitarian Level, Deviation Percentage (%), Time (in Seconds) and Purchase Intent for the Blue Group

Measure	Mean	SD	Minimum	Maximum	Range
Informational Level	8.17	1.03	5.50	9.65	4.15
Utilitarian Level	8.15	1.10	4.95	9.80	4.85
Deviation (%)	2.60	10.95	-22	25	47
Time (s)	449.83	180.71	233	1.271	1.038

Purchase Intent	5.26	1.45	2	8.33	6.33
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Source: Research data

Furthermore, it was observed that products 1(i.e., smartphone) and 5 (LED smart TV) had the lowest and highest means, respectively, among the analyzed products, both in terms of utility and informativeness. For the white and blue groups, product 1 had the inferred value closest to the actual value, while product 2 had the farthest inferred value for these groups. In the orange group, the inferred values of products 2 and 5 were the closest to the actual values. However, product 1 obtained the higher Deviation Percentage value

To provide a clearer understanding of the participants' response patterns, intragroup analyses were conducted for each of the groups. In this regard, correlations (Pearson) were performed among all five dependent variables presented in Tables 1, 2, and 3. Considering all these analyses, consistent and significant relationships were found only among the Informational Level, Utilitarian Level, and Purchase Intent measures in all three groups. Therefore, adhering to these criteria, Table 3 presents a correlation matrix between these three measures for the Orange, Blue, and White groups, respectively.

The data presented on table 3 show significant coefficients at $p < 0.01$, all of which are positive for all measures. It was verified that all coefficients exceeded 0.72, indicating a strong relationship between the measures. The data indicates that participants who scored higher in one measure exhibited the same pattern in the others.

Additionally, and this pattern was exclusively observed in the Orange Group, significant correlations were found between Time and the other measures, as follows: informational level ($r = -0.43, p > 0.05$), utilitarian level ($r = -0.53, p > 0.01$), and purchase intent ($r = -0.48, p > 0.01$). Therefore, participants who took longer to complete the task tended to attribute higher scores to those three measures.

Table 3

Correlation Matrix (Pearson) Between the Dependent Variables Informational Level, Utilitarian Level, and Purchase Intent for the Three Groups.

Variables	Group	Informational Level	Utilitarian Level	Purchase Intent
Informational Level	Orange	-	0.85	0.75
	Blue	-	0.80	0.71
	White	-	0.85	0.64
Utilitarian Level	Orange	0.85	-	0.72
	Blue	0.80	-	0.66
	White	0.85	-	0.61
Purchase Intent	Orange	0.75	0.72	-
	Blue	0.71	0.66	-
	White	0.64	0.61	-

Note. All correlation were significant in $p < 0.01$. Source: Research data

Thus, regarding the data obtained for the Blue and White Groups, despite some variations in the coefficients obtained, the same general pattern of correlations was observed as in the Orange Group. In other words, all had relatively high, positive, and significant coefficients at $p < 0.01$. However, it's worth noting that no significant correlations were found between time and the other measures.

Figure 4 depicts the scores obtained for Informational Level, Utilitarian Level, and Purchase Intent across the three groups. It's consistently evident that the scores attributed to Informational level are slightly higher than those for Utilitarian level in all three groups. Concerning intergroup

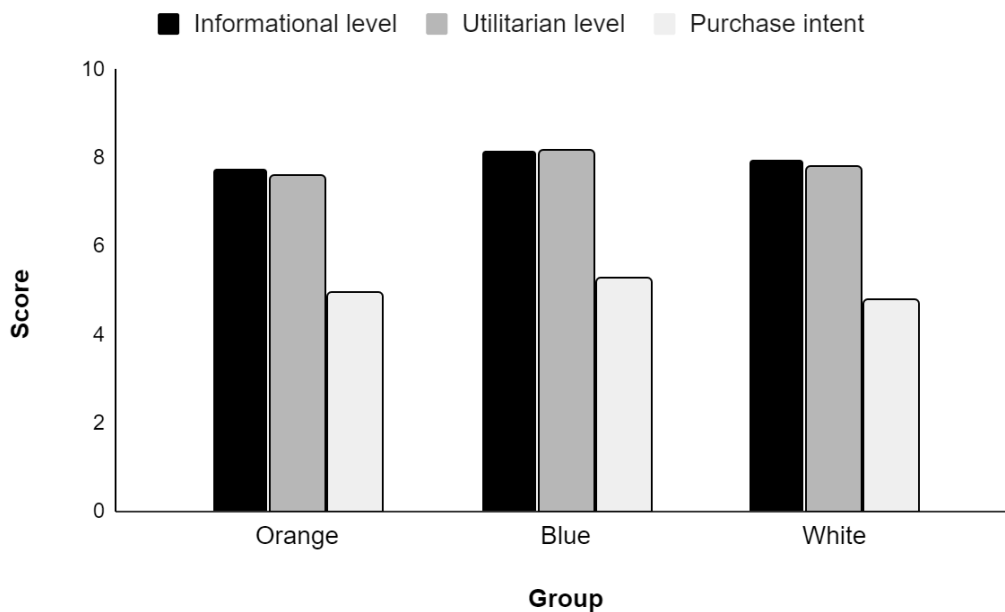
comparisons in general, consistently higher scores were observed for the blue group, followed by the orange group, and finally, the white group for all three measures.

To examine the differences between groups more consistently, a one-way Analysis of Variance (ANOVA) was conducted. Initially, these analyses were conducted for the measures of: (1) utilitarian level, (2) informational level, and (3) purchase intent, and followed by Tukey's post hoc test and found no significant results. As stated before, these measures were obtained by aggregating scores in the evaluation of the five products.

However, to further explore the relations between the variables, additional analyses were conducted employing the data from each individual product, to verify if on particular kind of product are more influenced by the colors than the other. In other words, the analyses compared the five measures of each of the three dependent variables cited previously between the three groups.

Figure 4

Between Groups Comparison for Informational Level, Utilitarian Level, and Purchase Intent.



Source: Research data

Following these criteria, the results from the ANOVAs, with two exceptions, did not show significant differences between groups. Regarding those exceptions, significant differences were found for informational level in Product 3: $F(2, 87) = 3.32, p = 0.04$. Tukey's post hoc test indicated that the difference was significant between the White and Orange groups ($p < 0.05$), without significant differences in specific comparisons between the Blue group and the others.

The other case refers to utilitarian level, in which significant differences were observed in Product 5: $F(2, 87) = 3.02, p = 0.05$. Finally, the post hoc test indicated a significant difference only between the Blue and Orange groups ($p < 0.05$). Similarly, for Purchase Intent, significant differences were only found for Product 5: $F(2, 87) = 5.25, p = 0.01$. In this case, the differences were also observed between the Blue and Orange groups ($p < 0.05$).

Additionally, it was possible to observe variations in the time spent on the task between the groups, with the most significant difference in the Azul group, where participants spent less time. To better examine these differences, and following criteria similar to those described earlier, analyses of variance (ANOVA) for time were conducted, which initially have not verified significant differences between the groups.

However, a more extensive exploration of these data led to the identification of one case as highly disparate from the others (i.e., outlier). Following the treatment of outlier data criteria described by Tabachnick and Fidell (2019), the time values were transformed into Z-scores, and cases

that exceeded a value of 4 or -4 were removed. As mentioned earlier, this occurred in only one case, which was participant 2 from the Orange group, with a time of 1271 seconds, almost three times the average time of the group.

Thus, the ANOVA was re-conducted with this data point excluded, and thus, the results were significant: $F(2, 86) = 5.05, p = 0.01$. The post hoc tests indicated significant differences at $p < 0.05$ for the Blue group compared to the others, but no such differences were observed between the White and Orange groups.

Lastly, analyses were conducted to verify if the environmental consequences related to consumption behavior could determine purchases. For this purpose, linear regressions were performed using informational and utilitarian level as independent variables and Intention to purchase as the dependent variable. The parameters obtained for the regressions in each of the groups were as follows: Orange Group, $R^2 = 0.59, F(2, 27) = 19.27, p < 0.01$; Azul Group, $R^2 = 0.52, F(2, 27) = 14.84, p < 0.01$; Branco Group, $R^2 = 0.42, F(2, 27) = 9.94, p < 0.01$.

Taken together, these results indicate that the variables informational and utilitarian level explain a significant portion of the variation in purchase intent, regardless of the color present in the context of virtual shopping (i.e., Orange, Blue, White). However, it was also observed that R^2 was higher for the warm and cool colors groups (i.e., Orange and Blue,) compared to the control group (i.e., White).

DISCUSSION

The present research aimed to understand the atmospherics effects of cool (i.e., blue) and warm (i.e., orange) colors on consumer behavior patterns when evaluating electronic products. The results indicated that the measures of informational level, utilitarian level, and purchase intent in intragroup comparisons presents high correlation (see Table 4). Therefore, it is understood that regardless of the color atmospherics employed on the website, people tend to consistently give higher ratings for these measures in all groups. In other words, when evaluating a product, individuals associate aspects of value or social prestige with the functionality of a particular product and, consequently, want to consume it (Golnar-Nik et al., 2019; Kim et al., 2020; Modi & Singh, 2023).

It is also noticeable that participants who evaluated items with high informational and utilitarian level scores tended to complete the tasks more quickly. However, significant results were only observed in the orange group. This shows that orange color can influence the way products are evaluated, inducing faster decision making, and exhibits a consistent pattern in the way people assess the product's characteristics.

Thus, even if the participant has no prior consumption learning history with the product, there is, probably, a learning history with the brand. This suggests that the high reinforcement for behavior patterns is directly linked to performance and functionality because it is from there that consumer goods that equate to high social status gain strength. Therefore, the brand is associated with the meaning of social prestige and quality mediated through social interactions, even if the products presented in the experiment have no brand identification. Hence, the consumer's consumption history with the brand becomes significant when it becomes an achievement for the consumer, and the virtual environment promotes consumption (Foxall, 2010, 2016; Gu et al., 2021). This result finds support on Cavalcanti et al. (2013), which shows the significant influence of the brand (i.e., informational level) on various consumer behavior patterns.

Furthermore, it's essential to note that the interpretation of this research differs from the traditional one, as demonstrated by Ettis (2017). Based on the interpretation of the BPM, it is shown that there is utilitarian punishment in the orange group because the time spent can be interpreted as a kind of response that makes the task more aversive. Thus, it is possible to interpret that since the research is conducted in a virtual environment, participants who tend to complete the task more quickly were seeking to get rid of the activity quickly.

Also, assuming that faster completion times can be interpreted as an indication of the aversiveness of the task, these results would be consistent with those of Putri and Balqiah (2017). Moreover, the present study shows that the blue group has more positive results when time is analyzed, resulting in

a higher intention to purchase by this group. Other possible interpretation is that the warm color induced higher speed in decision making and assessment. However, these two hypotheses must be more thoroughly tested in future research.

The results were not statistically significant regarding the effects of different color hues, as verified by the ANOVAs. Nevertheless, differences were found in the measures assessed for informational level, utilitarian level, and purchase intent between groups. Thus, the hypothesis behind the effect of colors on consumer behavior have found some empirical support and deserves to be further investigated.

However, the conditions established in this study may not have been sufficient to provoke such changes in consumer behavior a more significant manner. That is, the magnitude of the independent variables might not have been sufficient. Therefore, a suggestion for future research is the use of stronger colors or even other shades. Additionally, this effect may not have been verified due to the category of products used in this study, which were electronics. For this reason, it is suggested that products of a different nature, such as appliances and clothing, to be investigated.

Additionally, it was possible to verify through the linear regression analyses that more than 50% of the variation in purchase intent can be explained by informational and utilitarian levels. In this sense, the informative level has more weight than the utilitarian level, which aligns with the studies by Cavalcanti et al. (2013) and Oliveira-Castro et al. (2016), demonstrating that informational reinforcement significantly influences product choice in consumers.

Taking all these data together, the effects of color on a virtual environment or setting were modest. However, it can be inferred that an individual's behavior is largely determined by utilitarian and informational variables. Moreover, the general predictions of the BPM are sustained despite the color variation, but apparently, some aspect of color can influence these informational and utilitarian properties, as there was some differences between colors even though it was not significant. Hence, it is inferred that other research should further explore these factors.

The present research had some limitations regarding the sample. One of them was the number of participants, limited to 90 people. In future research, it will be necessary to increase the number of participants. In addition, it was not possible to analyze the Deviation Percentage measures in a more detailed fashion, as the method used in to obtain this measure (i.e., question on the evaluation task) was somewhat limited, and should have been better refined. Therefore, in future studies, it is essential that the item related to the inferred value is designed with future analyses in mind and produces reliable data. Finally, the background colors of the website did not have much effect. Thus, as stated previously the use of other colors or a more vibrant background color might be necessary.

Therefore, the present research demonstrated the applicability and expansion of the theoretical and methodological framework of the BPM for the study of atmospheric variables in the consumer behavior setting as previously investigated by Ferreira (2007). It also has practical implications and contributes to the professionals in the fields of Marketing, and Consumer Psychology, as well as the e-commerce industry, who seeks information regarding applications for e-atmospherics. Furthermore, it adds to the national literature, as there are not since there are not many Brazilian studies with similar objectives.

Lastly, it's important to note that this research also has potential social implications. As consumer behavior is a prevalent and socially significant phenomenon, thus, having clear knowledge about variables that influence consumer decisions is crucial. Atmospheric variables often operate unconsciously (cf. Kotler, 1973), and thus might be used despite of eventual detrimental effects on the consumer. That characteristic of the atmospheric effects makes their study even more relevant, especially concerning the implications for regulatory governmental bodies (e.g., Procon) to protect consumers from malpractice by stores and enterprises.

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Author contributions

Lorena Rodrigues: textual production, data collection and analysis, formatting, and submission.
Paulo Roberto Cavalcanti: textual production, data analysis, formatting, and final review.

Declaration of interests

The authors declare that they have no conflicts of interest.

References

- Cavalcanti, P. R., Oliveira-Castro, J. M., & Foxall, G. R. (2013). Individual differences in consumer buying patterns: a behavioral economic analysis. *The Psychological Record*, 63(2), 259-276.
<https://doi.org/10.11133/j.tpr.2013.63.2.003>
- de Mendonça, H. G. (2016). E-commerce. *Revista Inovação, Projetos e Tecnologias*, 4(2), 240-251.
<https://doi.org/10.5585/iptec.v4i2.68>
- de Oliveira, A. N., dos Santos, J. J., & Rodrigues, C. M. L. (2019). Análise Bibliométrica de Pesquisas Teóricas e Empíricas sobre E-Atmospherics. *Revista Administração em Diálogo*, 21(1), 25-38.
<https://doi.org/10.23925/2178-0080.2017v21i1.37681>
- Ettis, S. A. (2017). Examining the relationships between online store atmospheric color, flow experience and consumer behavior. *Journal of Retailing and Consumer Services*, 37, 43-55.
<https://doi.org/10.1016/j.jretconser.2017.03.007>
- Ferreira, D. C. S. (2007). *Efeitos de música ambiente sobre o comportamento do consumidor: análise comportamental do cenário de consumo*. (Doctoral Thesis, Universidade de Brasília).
<http://icts.unb.br/jspui/handle/10482/1050>
- Foxall, G. (2016). *Consumers in context: The BPM research program*. London: Routledge.
- Foxall, G. R. (1990). *Consumer psychology in behavioral perspective*. Washington, DC: Beard Books.
- Foxall, G. R. (2002). *Consumer behavior analysis: Critical perspectives in business and management*. New York, NY: Routledge.
- Foxall, G. R. (2010). Theoretical and conceptual advances in consumer behavior analysis: Invitation to consumer behavior analysis. *Journal of Organizational Behavior Management*, 30, 92-109.
- Foxall, G. R. (2013). Intentionality, symbol, and situation in the interpretation of consumer choice. *Marketing Theory*, 13(1), 105-127.
- Foxall, G. R., & Oliveira-Castro, J. M., & James, V. K., & Schrezenmaier, T.C. (2011). Consumer behaviour analysis and the behavioural perspective model. *Management Online Review (MORE)*.
<http://www.moreexpertise.com/view.php?id=70>
- Golnar-Nik, P., Farashi, S., & Safari, M. S. (2019). The application of EEG power for the prediction and interpretation of consumer decision-making: A neuromarketing study. *Physiology & behavior*, 207, 90-98. <https://doi.org/10.1016/j.physbeh.2019.04.025>
- Gu, S., Ślusarczyk, B., Hajizada, S., Kovalyova, I., & Sakhibieva, A. (2021). Impact of the covid-19 pandemic on online consumer purchasing behavior. *Journal of Theoretical and Applied Electronic Commerce Research*, 16(6), 2263-2281. <https://doi.org/10.3390/jtaer16060125>
- Janakiraman, R., Lim, J. H., & Rishika, R. (2018). The effect of a data breach announcement on customer behavior: Evidence from a multichannel retailer. *Journal of Marketing*, 82(2), 85-105.
<http://dx.doi.org/10.1509/jm.16.0124>
- Kim, D., Hyun, H., & Park, J. (2020). The effect of interior color on customers' aesthetic perception, emotion, and behavior in the luxury service. *Journal of Retailing and Consumer Services*, 57, 102252. <https://doi.org/10.1016/j.jretconser.2020.102252>
- Kotler, P. (1973). Atmospherics as a marketing tool. *Journal of retailing*, 49(4), 48-64.

- Loureiro, S. M. C., & Roschk, H. (2014). Differential effects of atmospheric cues on emotions and loyalty intention with respect to age under online/offline environment. *Journal of Retailing and Consumer Services*, 21(2), 211-219. <https://doi.org/10.1016/j.jretconser.2013.09.001>
- Lucchese, S. M. & Ribeiro, N. B. (2011). *Comportamento do consumidor: aspectos culturais*. Retrieved from <https://www.yumpu.com/pt/document/view/33710807/centro-de-educacao-superior-barnabita-faculdade-padre-machado>
- Modi, N., & Singh, J. (2023). Understanding online consumer behavior at e-commerce portals using eye-gaze tracking. *International Journal of Human-Computer Interaction*, 39(4), 721-742. <https://doi.org/10.1080/10447318.2022.2047318>
- Nalini, L. E. E. G., de Melo Cardoso, M., & Cunha, S. R. (2013). Comportamento do consumidor: uma introdução ao Behavioral Perspective Model (BPM). *Revista Fragmentos de Cultura-Revista Interdisciplinar de Ciências Humanas*, 23(4), 489-505. <https://doi.org/10.18224/frag.v23i4.2976>
- Oliveira-Castro, J. M., Cavalcanti, P. R., & Foxall, G. R. (2016). What consumers maximize: Brand choice as a function of utilitarian and informational reinforcement. *Managerial and Decision Economics*, 37(4-5), 360-371. <https://doi.org/10.1002/mde.2722>
- Peck, J., & Childers, T. L. (2008). Sensory factors and consumer behavior. In C. P. Haugtvedt, P. M. Herr & F. R. Kardes (Eds.), *Handbook of consumer psychology*, (pp. 193-219). Taylor & Francis.
- Pierce, W. D., & Cheney, C. D. (2017). *Behavior analysis and learning: A biobehavioral approach*. Routledge.
- Putri, K. D., & Balqiah, T. E. (2017). Do Web Atmospherics Affect Purchase Intention? The Role of Color and Product Display. *Journal of Management and Marketing Review*, 2(2), 79-86. [https://doi.org/10.35609/jmmr.2017.2.2\(12\)](https://doi.org/10.35609/jmmr.2017.2.2(12))
- Reis Junior, F. N. dos, & Torres, C. (2018). As aparências se atraem: valores culturais e consumo de produtos de moda falsificados. *Revista Thema*, 15(1), 119-132. <https://doi.org/10.15536/thema.15.2018.119-132.560>
- Ribeiro F. E. S., & Freitas M. (2021). E-commerce. *Seminário de Tecnologia Gestão e Educação*, 3(1). Retrieved from <http://raam.alcidesmaya.com.br/index.php/SGTE/article/view/320>
- Skinner, B. F. (1974). *About Behaviorism*, New York: Vintage.
- Solomon, M. R. (2016). *O Comportamento do consumidor: comprando, possuindo e sendo*. Bookman Editora.
- Varian, H. R. (2010). *Intermediate microeconomics: a modern approach*. New York: W. W.
- Verma, P., & Prashar, S. (2017). Moderating Effect of Color on Store Atmospherics Predictors. *The Journal of Business Economics and Environmental Studies*, 7(1), 13-23. [10.13106/eajbm.2017.vol7.no1.13](https://doi.org/10.13106/eajbm.2017.vol7.no1.13)
- Wells, V. K., & Foxall, G. R. (2011). Consumer behaviour analysis and services. *The Service Industries Journal*, 31(15), 2507-2513. <https://doi.org/10.1080/02642069.2011.531122>
- Wilson, N., Keni, K., & Tan, P. H. P. (2019). The effect of website design quality and service quality on repurchase intention in the e-commerce industry: A cross-continental analysis. *Gadjah Mada International Journal of Business*, 21(2), 187-222. <https://doi.org/10.3316/INFORMIT.624899661902840>