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Validation of Decision-Making Experimental Tasks in a Social Commerce Environment

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ABSTRACT

This study aimed to validate two purchase decision experimental tasks in a social commerce environment. This refers to online interactions and their contributions to users on websites in order to assist in their acquisition of goods and services. For that purpose, a quasi-experiment was developed to simulate the decision invoved in making a hotel reservation and purchasing a TV, using the eye tracking technique to analyze the processing of information. Task validation comprised the operationalization of the eye tracker, validation with specialists, and a pilot test. The fixation metrics and heat maps identified the areas of interest that received the most visual attention from the participants. It should be noted that the products' recommendations were the most considered criterion. This study contributes to understanding the search for information and purchase decisions in social commerce.

KEYWORDS

Social Commerce, Experiment, Decision-Making Process, Eye Tracker

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Validação de tarefas experimentais de decisão em ambiente de *social commerce*

RESUMO

Este estudo teve como objetivo validar duas tarefas experimentais de decisão de compra em ambiente de *social commerce*. Esse termo se refere a interações *online* e contribuições dos usuários em sites com o intuito de auxiliar na aquisição de bens e serviços. Para tanto, foi desenvolvido um quase-experimento para simular a decisão de reserva de hotel e de compra de um televisor, com a aplicação da técnica de *eye tracking* para análise do processamento da informação. A validação das tarefas contemplou operacionalização do equipamento *eye tracker* e validação com especialistas e teste piloto. Por meio das métricas de fixações e dos mapas de calor foram identificadas as áreas de interesse que receberam mais atenção visual dos participantes. Destaca-se que as recomendações de produtos foram o critério mais considerado. Este estudo contribui com a compreensão sobre a busca de informações e a decisão de compra no *social commerce*.

PALAVRAS-CHAVE

Social commerce, Experimento, Processo decisório, *Eye tracker*

1. INTRODUCTION

In the last few years, the growing popularity of social media has created a new era of electronic commerce, called social commerce, changing how online shopping is understood (Chen & Shen, 2015). According to Taiebi Javid et al. (2019), this environment uses social media technologies and the infrastructure of Web 3.0 to support online interactions and the contributions of users, aiming to assist in the acquisition of goods and services.

The relevance of social commerce in terms of the volume of business is notorious, with the expectation of reaching US$ 3.7 trillion by 2027, according to the report of Research and Markets (2022). From this perspective, many managers have concentrated on stimulating consumers to engage with social commerce and the repurchase of products. However, as highlighted by Molinillo et al. (2021), in addition to attracting customers into this environment, executives should also prioritize their retention since loyalty is essential to obtain long-term benefits.

Different factors influence consumers' intention to use social commerce websites, which have attracted academic interest. In this regard, Kim and Park (2013) analyzed the influence of the characteristics of social commerce on consumers' trust. In another study, Tuncer (2021) observed that trust in the social media platform, sellers, and the flow of the experience is positively related to the intention of using this environment. Molinillo et al. (2021) observed that the quality of information and services is a fundamental antecedent of perceived value, an essential booster of customer loyalty concerning social commerce.

Ahn et al. (2018) highlighted that the success of online commerce is constantly attributed to the ability of vendors to 'capture eyeballs,' an indispensable ability in a market which is characterized by an overload of information. Furthermore, it is known that the human psychic structure has practical limitations that prevent people from fully processing what they feel (Sternberg, 2008), as observed in the stages of perception: i) selection, involving the filtration and choice of the information perceived, performed through attention, experiences, needs, and preferences; ii) organization, through which the stimuli are gathered into groups in order to attribute meaning;

iii) interpretation, consisting of the conclusion of the process of meaning attribution to information based on the individual's experiences and expectations. For Sternberg (2008), perception consists of a set of psychological processes that enable recognition, organization, synthesis, and attribution of meaning, at a cognitive level, to sensations received from environmental stimuli through sense organs.

Thus, attention is directed toward the most important issues, and the efforts of the cognitive system are concentrated on only part of the whole information acquired. Pärnamets et al. (2015) stressed that visual attention should be considered to support judgment and decision processes, regardless of the task to be developed.

Visual attention, essential in the first stage of perception, is understood as the degree to which people visually focus stimuli within their range of exposure (Solomon et al., 2010), constituting an important condition for product choice (Audrin et al., 2018). From this perspective, human cognitive processing can reveal the strategies employed when performing tasks such as decision-making (Luan et al., 2016).

One of the ways to analyze the visual attention of individuals and how they process information is through eyeball tracking. According to Rayner (2009), there is a close correspondence between eyeball movements and higher-order cognitive processes. Other studies have investigated the processing of information through the analysis of visual attention, as recorded by equipment that tracks eyeball movement (Audrin et al., 2018; Bender, 2019; Tagliapietra, 2018; Wu et al., 2019).

Considering that social media tools allow ordinary users to opine about goods and services by recommending, evaluating, and classifying them; the following question arises: What is the impact of these opinions, and how are they used by new users who will decide their choices from the options availible based on recommendations? When examining the status and evolution of scientific studies about the effect of social media on e-commerce, Taiebi Javid et al. (2019) observed that investigations have grown exponentially since 2009, indicating a significant, although underdeveloped, field of research.

From this perspective, this study aims to validate two purchase decision experimental tasks in a social commerce environment. For that purpose, a quasi-experiment was performed by applying the eye-tracking technique to analyze information processing regarding the decision to purchase two products. This technique aims to capture and quantify people's visual attention behavior, and uses fixations and gaze points as basic measurements (Farnsworth, 2018).

With the validation of experimental tasks, the study investigated the search criteria used by the participants, how their online navigation occurs, their pre-purchase decisions, and the information sorting patterns in purchasing different products. The study's contributions involve the advanced understanding of the search for information and the purchase decision in social commerce, resulting in another approach when validating experimental tasks that simulate the purchase of a tourist service and a durable good using eye tracker equipment to analyze the processing of information. Therefore, the study presents aspects that allow social commerce and sale opportunities to develop.

Previous studies that highlighted differences in the purchase behavior and engagement of customers regarding the acquisition of goods and services were considered for selecting the two products (a hotel and a TV) (Almeida & Düsenberg, 2014; Jetley & Shivendu, 2018). Given the characteristics of services, intangibility, inseparability, variability, and perishability (Zeithaml et al., 1985), there are differences regarding the purchase of goods since consumers do not evaluate an object but rather processes and performances. Furthermore, services are provided and consumed simultaneously, which are not identical, and cannot be stocked or stored.

On the other hand, studies on individuals' online behavior constitute an essential aspect of the success of social commerce since, by understanding factors that affect consumers' decisions in the virtual environment, it is possible to advance theoretical and practical perspectives and contribute to improving technological platforms.

2. THE DECISION-MAKING PROCESS AND SOCIAL COMMERCE

Deciding comprises a choice process among several available alternatives, aiming to maximize a subjective gain or achieve an established objective through the evaluation and establishment of a preference based on contextual and internal information (Cortes et al., 2021). According to Simon (1997), the decision-making process comprises the conscious or unconscious selection of particular actions based on innumerable possibilities at the reach of the subject responsible. According to Lehnhart (2016), studies on decision-making have evolved over time, accompanying changes in the perception of human rationality as pioneer studies considered decision-making a totally rational process.

The rational model establishes that decision-makers use perfect information and can evaluate each alternative rationally, aiming at totally impartial and befitting decision-making (Pereira et al., 2010). From this perspective, the limitations and subjectivities of the human psyche are disregarded in Classical Decision Theory. However, even if decision-makers aim to be rational in their behavior, they are still subject to limitations in the process.

Simon (1955), when presenting the Theory of Bounded Rationality, stressed that individual judgment is limited by rationality, and the decision-making process is better understood based on the analysis of real decisions instead of only prescriptive decisions. Such a perspective acknowledges the limitations of the information processing capacity of decision-makers and suggests that human behavior is modulated by its interaction with the task's context (Simon, 1990). Therefore, based on the groundbreaking study by Simon (1955), the information processing approach is the paradigm that boosts investigations about judgment and decision-making (Payne & Bettman, 2004).

With Web 3.0, decision-making has been transformed in the last few decades through changes in the creation, procurement, and exchange of information (Cantallops & Salvi, 2014) by allowing worldwide access to a large information volume. Furthermore, through virtual technologies, transactions on goods and services are performed between companies and individuals, in addition to information exchange. Thus, the internet constitutes the primary source of information for many consumers who experience the decision-making process (Yayli & Bayram, 2012).

The development of electronic commerce has allowed the emergence of social commerce, which can be understood as the expansion of social media and the improvement of e-commerce by allowing online interaction between consumers (Marsden, 2010; Liang & Turban, 2011). Whereas e-commerce aims to maximize efficiency by customizing experiences and offering superior resources, social commerce focuses on creating a collaborative virtual experience and social interactions Molinillo et al. (2021).

Thus, social commerce involves lists of recommendations, evaluations, comments, and reciprocity apps, which increase consumer participation and enable the collection of information-rich resources, resulting in a more reliable and social transaction environment (Lu et al., 2016). In addition, online product recommendations (OPRs) are a way for consumers to surpass the limitations of e-commerce, e.g., the impossibility of testing products, the absence of personal contact with sellers and service providers, and insecurities about purchase risks (Baek et al., 2015).

In this process, people stop being passive information receivers and become part of an interactive process that stimulates value creation based on collaborative activities such as information sharing and content creation (Li, 2019).

Furner and Zinko (2017) stressed that if adequate information is available in online recommendations, and consumers can evaluate the exposure and coverage of a product, they tend to develop reliable beliefs and, consequently, show higher purchase intention levels. Furthermore, Hajli (2015) stressed that when individuals access evaluations regarding goods or services, their familiarity with the company increases, bringing confidence to carry out a transaction. Studies on social commerce often involve two aspects, one of them comprising websites and social media pages that incorporate commercial resources to allow transactions and advertisements, and another involving traditional e-commerce websites that include tools to facilitate social interaction and information exchange (Liang & Turban, 2011; Zhang & Benyoucef, 2016). From this perspective, electronic commerce websites, e.g., Amazon, are understood as e-commerce practices as they include online product recommendations from consumers in their transactions.

The literature indicates that interpersonal relationships developed through social commerce facilitate the exchange of information and recommendations, contributing to the decision-making of individuals (Baek et al., 2015; Kim & Park, 2013). With the purpose of understanding the decision process in social commerce websites, this study uses the eye tracking technique to analyze the consumer's information processing. Payne and Bettman (2004) stressed that monitoring acquisitive behavior and the consequent information processing is a widespread process tracking method used in decision research, highlighting eye tracking as one of the most used techniques in the field. Originating from neuroscience, eye tracking allows the exploration and interpretation of decision-making behavior and cognitive processing.

Furthermore, the application of neuroscience into marketing– Neuromarketing – provides gains in understanding consumers' reactions, as stated by Colaferro and Crescitelli (2014). For these authors, there is a need to understand more about decision-making processes based on techniques used to obtain reactions to undeclared stimuli and their polarity based on neuroscience measurements and techniques. From this perspective, the eye-tracking analysis of consumers in virtual environments is valuable for identifying perceptual, emotional, and cognitive processes that lead to a decision (Chae & Lee, 2013). When observing the search and information processing behavior of individuals, their visual attention is analyzed based on the dwelling time in a given region, which is measured by the total number of fixations on an attribute or the total time spent on the attribute (Balcombe et al., 2015). According to Chae and Lee (2013), eye fixations are understood as information acquisition responses, and their tracking efficiently provides information about humans. On the other hand, Howard and Sheth (1969) stressed that visual attention is usually focused on the information (characteristics, attributes, or alternatives) considered most relevant to the decision maker. In contrast, other types of information are visualized for a shorter period or are not even analyzed.

3. STUDY METHOD

A quasi-experiment was developed in a laboratory to validate two experimental purchase decision tasks in a social commerce environment. According to Aussems et al. (2011), this design is comparable to randomized experiments regarding its terminology and elements, i.e., using pre-tests and control groups. However, this design lacks total control regarding the attribution of individuals to treatments, justifying its quasi-experiment status. Therefore, in order to facilitate the reading and understanding, the term 'experiment' will be adopted to replace 'quasi-experiment.'

The participants of the validation sessions were consumers who already had some previous contact with electronic commerce when searching for information about products and/or effecting purchases in the online environment. The validation was performed with eight subjects, using a non-probabilistic sample selected by convenience among students and public servants of a Federal University in the interior of Rio Grande do Sul. Five women (62,5%) and three men (37.5%) participated in the study, resulting in a limited sample. The volunteers had ages ranging from 22 to 40 years and performed more than five annual online purchases, considering the acquisition frequency of items in the online environment. The experimental sessions were developed in February and March 2021.

The experiment was conducted in a laboratory environment to ensure the highest control possible over the variables and thus guarantee the internal validity of the research. The internal validity of an experiment is guaranteed through the control, which is achieved using comparison groups, and the equivalence of groups in all aspects except the manipulation of independent variables (Sampieri et al., 2013).

In task development, at least two comparison groups were established, which were similar in virtually all aspects except manipulating independent variables. The selection of participants was random, thus ensuring an initial equivalence between groups. Other actions were adopted to ensure the experimental control, e.g., performing tasks with a short duration of about 30 minutes to avoid making the subjects tired, and instruction standardization based on the conduction of tasks by only one researcher.

The participants performed the experimental tasks in a reserved room with the aid of a screen, a mouse, and a Pupil Mobile Eye Tracking Headset. The eye tracker, used together with programs Pupil Capture and Pupil Player, allowed the capture, export, and analysis of eye-tracking data. The software version considered in this study was Pupil v3.0.7, the latest version made available by Pupil Labs in 2019.

The eye tracking technique allows the discrete measurement of the consumer's visual attention during the purchase process, providing insights about how to stimulate the sale of products or assist consumers in making better decisions (Meissner et al., 2019). Furthermore, it provides a database for several metrics. On the other hand, applying this technique is costly, since the research is applied individually using eye tracking. The experimental tasks included choosing a hotel and a TV for purchase. The participants were informed of a hypothetical situation in which they were granted a free trip to Natal, in the State of Rio Grande do Norte, and should choose a hotel for their stay. The city of Natal was chosen because it represents one of the most sought tourist destinations from June to July 2019, according to a survey conducted by the Ministry of Tourism of Brazil (2019). Furthermore, for the TV purchase, the participants were informed of a hypothetical situation in which they received a coupon, and all alternatives available showed a value below that of the granted bonus.

The volunteers who agreed to participate in the study signed the Term of Free and Informed Consent – TCLE and were attributed tasks. Four alternatives of hotels and televisions were presented in a fictitious virtual environment that simulated a social commerce website aiming to make the tasks as similar as possible to real decisions. Each participant completed two tasks, and their order was alternated. Each task relied on a specific website for the product, although with similar constitutions and layouts.

In each website, seven screens formed the decision scenarios, arranged as follows: i) a home screen with a brief explanation of the task (Figure 1(a)); ii) a general screen with four options of hotels or televisions (Figure 1(b)); iii) a specific screen for each alternative, with information

about the decision criteria of the product, e.g., specifications, price, images, and recommendations of other consumers (Figure 1(c)); and iv) an end screen with the confirmation of the product selected (Figure 1(d)).

It should be noted that Figures 1(b) and 1(c) have fiducial markers, which are squared 5X5 markers that allow defining Areas of Interest (AIOs) by establishing flat surfaces in the environment. AOIs are rectangular regions of interest that indicate information units in the visual field (Salvucci & Goldberg, 2000). The markers are identified by both Eye Tracker programs used in the study, Pupil Capture and Pupil Player. The areas of interest were previously described considering each decision criterion (specifications, price, and OPRs) for later analysis.

The decision criteria or attributes considered in this study were based on previous investigations conducted in the context of social commerce (Bender, 2019; Soares et al., 2015; Tagliapietra, 2018): i) Specifications; ii) Price; and, iii) Recommendations – OPRs. It should be noted that the hotels selected are real and located in Natal / RN. The establishments chosen were classified as four star hotels and showed approximate characteristics and prices. The OPRs were obtained based on real opinions of consumers about the hotels, retrieved from the main online hotel comparison websites. For the televisions, real OPRs were also selected among those available for each model in social commerce websites. The two leading TV brands in 2018 were used in the study, i.e., Samsung and LG (Costa, 2018), in addition to having similar models for comparison purposes among the participants.

The eye tracker equipment was used to determine the physiological measure of the positioning of the ocular fovea of the subjects, indicating the processing of information by the participants during each experimental task. Data analysis considered the individuals' fixations, a measure used to analyze visual attention in the screens and areas of interest of the websites. Fixation refers to the time during which an eye remains focused on a given region (Berger, 2019). Color maps were also analyzed, showing the overall distribution of gaze position movements, indicating the areas that most attracted the subjects' attention.

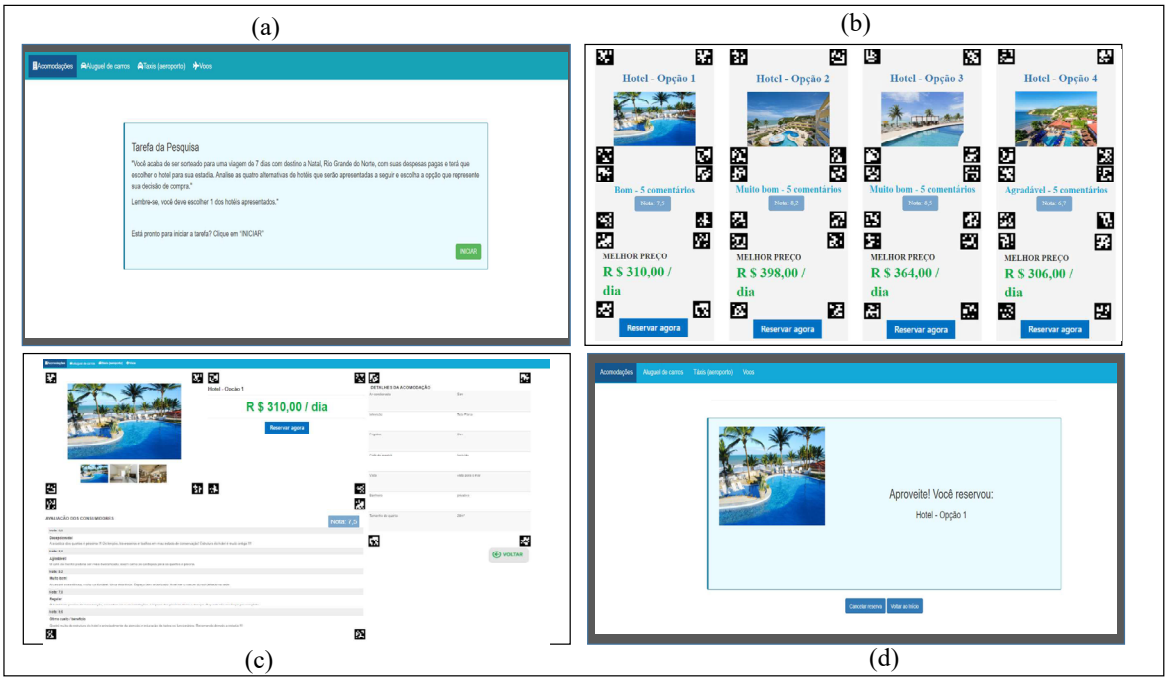

Figure 1. Screens of the decision scenario
Source: Constructed by the authors (2021).

This study was approved by the Research Ethics Committee (CEP) of the Federal University of Santa Maria (UFSM) under the CAAE no. 30533420.0.0000.5346. Subsequently, the study presents the validation procedures of the decision-making tasks.

4. VALIDATION OF THE DECISION-MAKING TASKS

4.1. Eye tracker operationalization

The application of eye tracking involves recording eye movements with a camera while exposing the participant to a stimulus, e.g., a text, picture, or video. The eye tracking technique used in the experiment and its operationalization stages are based on Tagliapietra (2018) and Bender (2019). The first stage comprised the planning of the study guidelines. Then, the variables measured, target audience, research application environment, metrics, analyses, and the equipment used were established based on the objective proposed.

The equipment used in the study was the eye tracker Pupil Mobile Eye Tracking Headset manufactured by Pupil Labs. The equipment is similar to a pair of glasses (Figure 2), is lightweight and adjustable, and is connected to a computer. The hardware has a high-speed 2D camera (word camera) that captures the scenario where the experimental subject is located, and two high-speed, 200 Hz eye cameras (Pupil Labs, 2021) used to capture the movements of the subjects' foveas.

Figure 2. Pupil Mobile Eye Tracking Headset eye tracker
Source: Pupil Labs (2021)

The equipment is used together with the software Pupil Capture, detecting the pupil orbit and performing eye tracking as the software records video and audio data in the environment, transmitting them in real-time and recording the data in an open format (Pupil Labs, 2021). When starting the software and connecting the device, the first action consists of detecting the pupil of each participant.

Then, the second stage of the experiment was started, i.e., its execution. In this stage, the equipment was calibrated for each participant since the eye tracker requires previous adjustment according to the particularities of the eye movements of each individual. Next, the task was performed using the equipment. The data obtained by the eye tracker involve metrics for descriptive analyses, heat maps, and quantitative data such as the total time, average dwell time, total number of fixations per visit, number of fixations per alternative, and duration of the fixations.

The third stage involves the reports, including analyzing the basic eye movement measurements, fixations, and saccades. The saccade corresponds to the change of eyes into the focused area, whereas fixation is when an eye remains focused on a given region (Berger, 2019). In this study, the fixation is considered based on the minimum duration of 200 milliseconds, as recommended by Pupil Labs (2021). For the identification of fixations and saccades, it is necessary to define the surface trackers in the system, establishing the flat surfaces used to track the Areas of Interest (AOIs).

4.2. Validation with specialists and pilot test

This section presents the validation procedures performed with specialists about the websites created and the pilot test of the experimental tasks. After developing the first versions of the website for each type of product (hotel and TV), this version was presented to three specialists in the Information Systems area who developed studies on the decision-making process. The study's objective was presented to these specialists, who evaluated the virtual environment, considering elements such as design, the composition of decision scenarios, the arrangement of information, and the similarity with actual online purchase environments, indicating their adequacy to the proposed investigation. Therefore, adjustments were not necessary.

Subsequently, a pilot test was performed with eight people. The data obtained were jointly analyzed with an Information Systems specialist who develops studies on the decision-making process, aiming to verify that the procedures met the proposed objective.

Only in this stage were adjustments necessary, referring to the size of the website screens, which required larger monitors to perform the tasks. Furthermore, new instructions were included for the participants, referring to the absence of minimum or maximum times to finish the tasks or a correct alternative to be selected. The conduction of the pilot test is presented below.

4.2.1. Conduction of the pilot test

The pilot test comprised the experimental stages—shown in Figure 3—simulating the purchase process on a social commerce website. Initially, volunteers were invited to collaborate individually with the investigation. These participants were explained the objectives of the study and task development. Those who agreed to participate in the pilot test signed the Term of Free and Informed Consent and were attributed tasks. It should be noted that the volunteers only participated in the pilot test and not in the other research stages.

The fictitious website, composed of decision scenarios to choose a tourist service (hotel) and a durable good (TV), was presented to the participants. The tasks had an alternate presentation order aiming to minimize the bias effects, and the subjects were distributed randomly.

In the experiment, the participants' visual attention was analyzed using fixation metrics recorded in the eye tracker equipment. First, the participants were explained the functionalities of the eye tracker and its application in the study. Next, pupil detection and calibration procedures were performed.

The participant then started one of the tasks using the eye tracker. Instructions were exhibited on the home screen, and the individual advanced to the screen of the fictitious website. After analyzing the decision criteria of four hotel or TV alternatives, the participant concluded the purchase decision task, which could be done on the general screen or the specific screen of each alternative. All volunteers completed the purchase task by choosing one alternative, although they could give up or stop at any moment during the experiment. Next, an instrument was applied with questions about the users' characteristics regarding online purchases, the product acquisition experience, and their profiles.

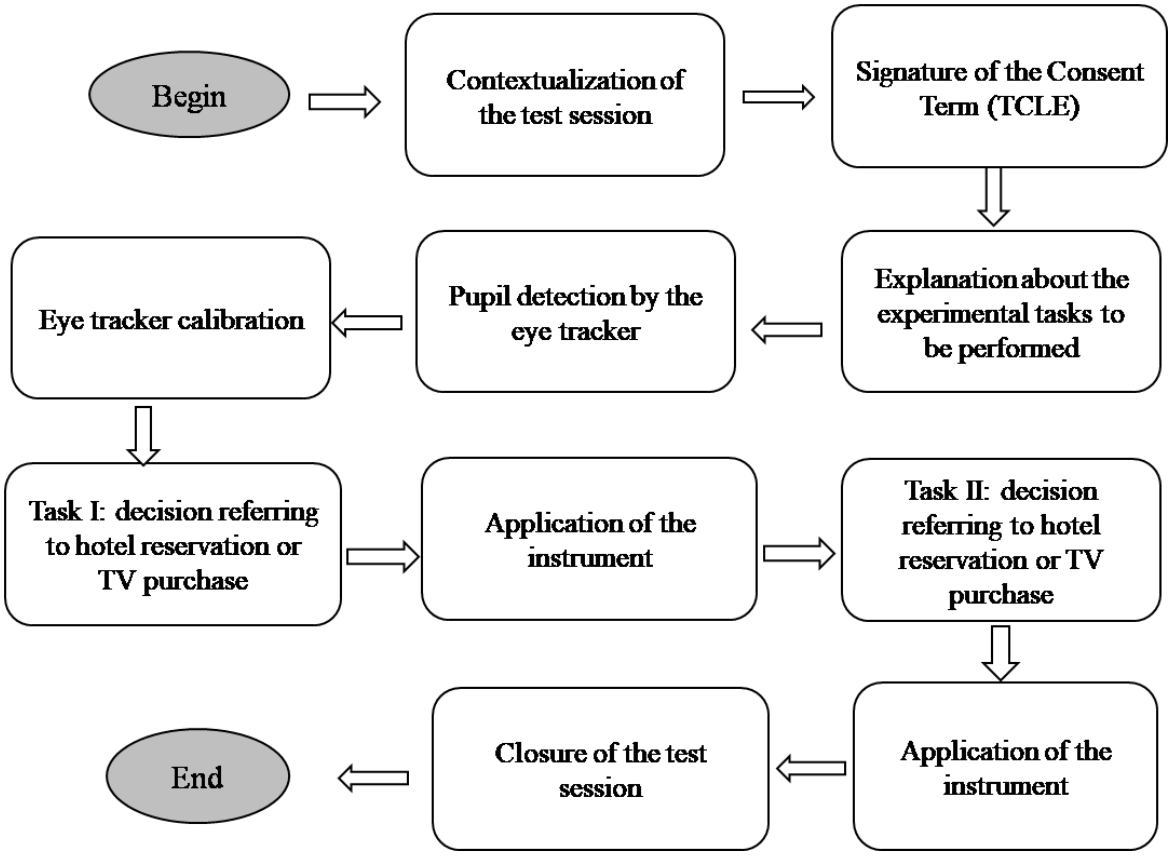

Figure 3. Stages of the experiment
Source: Constructed by the authors (2021)

The next stage comprised the second task, which consisted of choosing a different object of analysis (product). After the second product was chosen, the instrument was applied again, with questions about the previous purchase experience of the item analyzed in the task. Finally, the test session was finished, and the participants were thanked for their voluntary participation.

5. DATA ANALYSIS REGARDING THE VALIDATION SESSIONS

The experimental sessions were individually visualized and analyzed in the software Pupil Player. Data analysis aimed at identifying the processing of information by decision-makers based on physiological fovea positioning measurements generated by the eye tracker.

Table 1 shows the times spent on each task per participant. It should be noted that the tasks had an alternate order among participants, with some choosing to begin with the hotel decision task (subjects 1, 2, 5, and 6) while others began by choosing the TV (subjects 3, 4, 7, and 8).

Six participants spent more time choosing the hotel compared to the TV, even if these times were close. During the development of the experiment, the same amount of information was used in the criteria chosen for the two products to balance the items and information available for decision-making, even though the nature of the objects of analysis is different, which can result in differences in information processing and decision-making. In contrast to goods, services are evaluated based on processes and performances, are variable, cannot be stocked, and are performed and consumed simultaneously (Zeithaml et al., 1985). According to Tan et al. (2018), tourist products' experiential and intangible nature provides them with differences in relation to other product categories, making the decision process lengthier.

Table 1
Total time of the choosing process

	Hotel task	Order	TV task	Order
Subject 1	4min38sec	1	3min30sec	2
Subject 2	5min38sec	1	6min17sec	2
Subject 3	3min10sec	2	2min38sec	1
Subject 4	3min8sec	2	2min44sec	1
Subject 5	5min36sec	1	4min44sec	2
Subject 6	1min56sec	1	4min11sec	2
Subject 7	4min9sec	2	3min53sec	1
Subject 8	3min13sec	2	3min8sec	1

Source: Constructed by the authors

The fixations, which highlight the subjacent cognitive behavior of individuals, are shown in Table 2. Acronyms H1, H2, H3, H4, T1, T2, T3, and T4 refer to each hotel and TV alternative, respectively. According to Farnsworth (2018), the following fixation metrics generated by the Pupil Player software were recorded: i) total fixations during the task; and ii) fixations per area of interest (on the general screen of each hotel/TV alternative and the specific screens of each decision criterion). It should be noted that the total number of fixations considered those performed within the information environment of the experiment, i.e., those performed on the screen on which the fictitious websites were presented. The total fixations can surpass the sum of fixations per criterion and alternative due to the time dedicated to the instructions on the home screen and the message on the end screen.

The fixation analysis of each participant enables identifying data that generated deeper processing, or even reflected the difficulty in contemplating aspects in the decision-making process since the long duration of fixations could signal information extraction problems or indicate that the object of analysis is somehow more involving (Just & Carpenter, 1976). Moreover, according to Löbler et al. (2019), many fixations in a given area of interest could represent greater attention spent on information, indicating more importance to the individuals.

Table 2
Fixation metrics

	Task	Total number	Fixations per alternative – General screen	Fixations per decision criterion – Specific screen			
				H1 / T1	H2 / T2	H3 / T3	H4 / T4
Subject 1	Hotel	169	H1 – 5	Picture – 0	Picture – 8	Picture – 4	Picture – 0
			H2 – 7	OPRs – 14	OPRs – 20	OPRs – 40	OPRs – 22
			H3 – 8	Specif. – 7	Specif. – 0	Specif. – 3	Specif. – 0
			H4 – 1	Price – 0	Price – 0	Price – 0	Price – 0
	TV	305	T1 – 10	Picture – 5	Picture – 0	Picture – 2	Picture – 5
			T2 – 4	OPRs – 70	OPRs – 0	OPRs – 62	OPRs – 83
			T3 – 7	Specif. – 10	Specif. – 0	Specif. – 7	Specif. – 17
			T4 – 7	Price – 2	Price – 0	Price – 0	Price – 1

Table 2
Cont.

Subject 2	Hotel	364	H1 – 4	Picture – 1	Picture – 8	Picture – 4	Picture – 6
			H2 – 7	OPRs – 26	OPRs – 30	OPRs – 50	OPRs – 36
			H3 – 16	Specif. – 39	Specif. – 30	Specif. – 34	Specif. – 26
			H4 – 2	Price – 2	Price – 1	Price – 0	Price – 0
	TV	540	T1 – 7	Picture – 2	Picture – 1	Picture – 0	Picture – 12
			T2 – 2	OPRs – 82	OPRs – 69	OPRs – 69	OPRs – 36
			T3 – 5	Specif. – 80	Specif. – 20	Specif. – 54	Specif. – 52
			T4 – 4	Price – 4	Price – 7	Price – 3	Price – 0
Subject 3	Hotel	173	H1 – 10	Picture – 0	Picture – 0	Picture – 0	Picture – 0
			H2 – 15	OPRs – 16	OPRs – 28	OPRs – 15	OPRs – 21
			H3 – 14	Specif. – 5	Specif. – 10	Specif. – 6	Specif. – 6
			H4 – 7	Price – 1	Price – 1	Price – 0	Price – 0
	TV	208	T1 – 25	Picture – 1	Picture – 0	Picture – 0	Picture – 0
			T2 – 8	OPRs – 26	OPRs – 5	OPRs – 33	OPRs – 21
			T3 – 8	Specif. – 0	Specif. – 0	Specif. – 0	Specif. – 1
			T4 – 15	Price – 0	Price – 1	Price – 0	Price – 1
Subject 4	Hotel	92	H1 – 1	Picture – 0	Picture – 0	Picture – 0	Picture – 0
			H2 – 1	OPRs – 11	OPRs – 14	OPRs – 14	OPRs – 12
			H3 – 5	Specif. – 5	Specif. – 0	Specif. – 4	Specif. – 0
			H4 – 3	Price – 0	Price – 0	Price – 0	Price – 0
	TV	115	T1 – 6	Picture – 0	Picture – 0	Picture – 0	Picture – 0
			T2 – 5	OPRs – 27	OPRs – 5	OPRs – 13	OPRs – 5
			T3 – 15	Specif. – 0	Specif. – 1	Specif. – 0	Specif. – 1
			T4 – 17	Price – 0	Price – 0	Price – 2	Price – 2
Subject 5	Hotel	113	H1 – 1	Picture – 0	Picture – 0	Picture – 0	Picture – 0
			H2 – 3	OPRs – 25	OPRs – 29	OPRs – 43	OPRs – 0
			H3 – 3	Specif. – 0	Specif. – 0	Specif. – 0	Specif. – 0
			H4 – 1	Price – 0	Price – 0	Price – 0	Price – 0
	TV	193	T1 – 1	Picture – 0	Picture – 0	Picture – 0	Picture – 0
			T2 – 4	OPRs – 53	OPRs – 37	OPRs – 43	OPRs – 45
			T3 – 1	Specif. – 1	Specif. – 3	Specif. – 0	Specif. – 0
			T4 – 2	Price – 0	Price – 0	Price – 0	Price – 1
Subject 6	Hotel	122	H1 – 5	Picture – 0	Picture – 0	Picture – 0	Picture – 0
			H2 – 6	OPRs – 26	OPRs – 0	OPRs – 0	OPRs – 0
			H3 – 12	Specif. – 36	Specif. – 0	Specif. – 0	Specif. – 0
			H4 – 14	Price – 2	Price – 0	Price – 0	Price – 0
	TV	123	T1 – 7	Picture – 1	Picture – 0	Picture – 0	Picture – 1
			T2 – 3	OPRs – 22	OPRs – 0	OPRs – 9	OPRs – 4
			T3 – 16	Specif. – 8	Specif. – 0	Specif. – 2	Specif. – 10
			T4 – 6	Price – 6	Price – 0	Price – 0	Price – 0

Table 2
Cont.

Subject 7	Hotel	152	H1 – 3	Picture – 5	Picture – 4	Picture – 2	Picture – 7
			H2 – 3	OPRs – 21	OPRs – 22	OPRs – 18	OPRs – 26
			H3 – 6	Specif. – 4	Specif. – 2	Specif. – 2	Specif. – 2
			H4 – 6	Price – 0	Price – 0	Price – 1	Price – 0
	TV	82	T1 – 1	Picture – 0	Picture – 0	Picture – 0	Picture – 0
			T2 – 7	OPRs –12	OPRs – 23	OPRs – 5	OPRs – 7
			T3 – 8	Specif. – 0	Specif. – 2	Specif. – 0	Specif. – 1
			T4 – 6	Price – 0	Price – 0	Price – 0	Price – 0
Subject 8	Hotel	130	H1 – 1	Picture – 0	Picture – 0	Picture – 0	Picture – 0
			H2 – 1	OPRs – 27	OPRs – 2	OPRs – 11	OPRs – 5
			H3 – 7	Specif. – 2	Specif. – 0	Specif. – 3	Specif. – 0
			H4 – 4	Price – 0	Price – 0	Price – 0	Price – 0
	TV	130	T1 – 11	Picture – 0	Picture – 0	Picture – 0	Picture – 0
			T2 – 12	OPRs – 1	OPRs – 0	OPRs – 12	OPRs – 0
			T3 – 7	Specif. – 19	Specif. – 7	Specif. – 3	Specif. – 20
			T4 – 7	Price – 0	Price – 0	Price – 0	Price -0

Source: Constructed by the authors

Table 2 shows that the participants dedicated visual attention especially to the third hotel option, which showed the highest number of fixations. Regarding the TVs, the visual attention was distributed between options 1 and 3 in most cases. It should be noted that two TV brands were selected for the experiment: Samsung and LG. Options 1 and 4 corresponded to Samsung and alternatives 2 and 3 corresponded to LG. Thus, some subjects processed more information of a Samsung TV while others of a LG TV.

With regard to the decision criteria shown in the specific screen of each alternative, the OPRs were the most considered item since they had the highest number of fixations in all tasks, except the TV choice by subject 8. As stressed by Hwang et al. (2018), recommendations are an important source of information that allow consumers to acquire information related to products from known persons and users with relevant experiences, although geographically distant. It should be noted that the participants are similar with regard to their education level as they have either undergraduate and/or graduate degrees, which is a limiting factor for the study but, at the same time, contributes to understanding the findings.

The specifications were the second most considered criterion by the participants. According to Ulrich and Eppinger (2011), specifications aim to explain in precise and measurable detail the functionalities of products, manifesting the consumer's needs and differentiating the item from competing products.

The pictures and prices of products were items analyzed by only some participants. However, their visual behavior regarding price is justified by the tasks comprising prize draws/prizes in which the awarded individual does not have to disburse monetary value to acquire products.

It should also be noted that some subjects analyzed the information on the home screen and focused their visual attention only on preestablished options, disregarding the specific screens of other alternatives. This fact corroborates the cognitive limitation inherent in human beings, who select part of the whole information to direct their attention.

Another analysis provided by the Pupil Player corresponds to heatmaps, which show the overall distribution of eye movements (gaze points), identifying which elements attract more attention (Farnsworth, 2018). The equipment used in the experiment generates 60 gaze points per second, including fixations and saccades. Figure 4 shows examples of heat maps generated for the main screens visited by subjects 2 and 5.

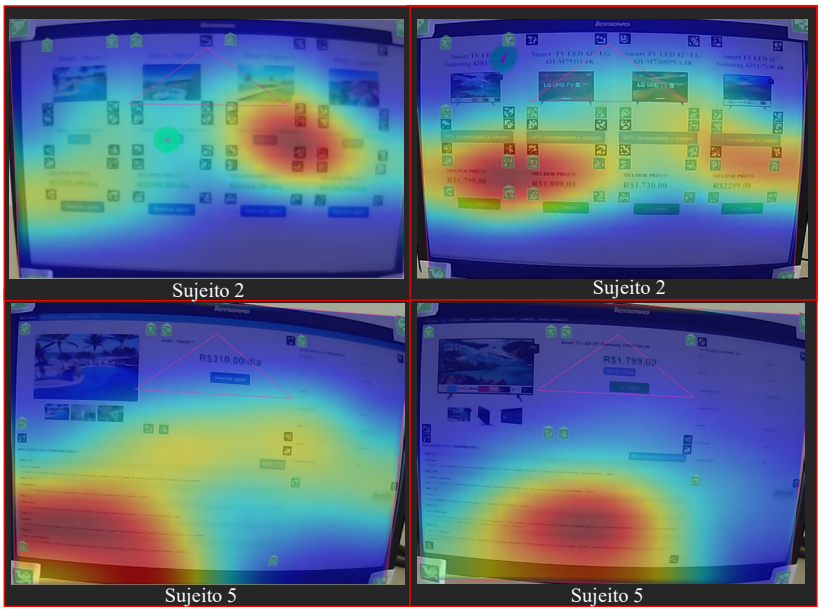

Figure 4. Heat maps
Source: Constructed by the authors (2021).

The regions with the highest number of gaze points are shown in red in the heat maps, indicating greater attention to the region. In contrast, regions with a more intense blue color corresponded to fewer gaze points. Therefore, subject 2 dedicated more attention to information about hotels 3 and 4, especially the grades attributed in the evaluations. Furthermore, that subject also considered the evaluations and the price of TVs 1 and 2. Differences are observed regarding the participant's visual attention to the two products since, for hotels, the dispersion areas were smaller and with fewer red colors, indicating more gaze points in the region.

When analyzing the specific product screens for the first hotel and TV options, subject 5 dedicated more attention to the evaluations, ratifying the results indicated by the number of fixations (Table 2). It is thus shown that the heat map generated in the Pupil Player software contributes to the cognitive behavior analysis of the individuals during task development.

6. FINAL CONSIDERATIONS

An experiment was developed to simulate the decision to make a hotel reservation and purchase a TV, aiming to validate two experimental decision-making tasks in a social commerce environment. The eye tracking technique was used to analyze the participants' information processing.

The first phase of the validation of decision-making tasks comprised the operationalization of the eye tracker through three steps: planning of the study guidelines, executions, and reports. Next, the validation procedures were carried out with specialists, as well as the pilot test of experimental tasks. The pilot test comprised the steps of the experiment by simulating the purchase process

on social commerce websites. As a result, the participants performed two tasks on the fictitious websites, composed of decision-making scenarios for choosing a hotel and a TV.

The participants' visual attention was analyzed using the fixation metrics recorded in the eye tracker. The areas that received the most visual attention from the participants were the third hotel option and the first and third TV alternatives. Furthermore, the most considered decision-making criterion corresponded to the OPRs, with more recorded fixations in the two tasks.

Recommendations are one of the main components of social commerce and are essential to discovering new products, in addition to having a strong influence on what consumers purchase and visualize online (Zhang & Bockstedt, 2020). Thus, understanding the effects of OPRs on decision-making, considering different forms of presentation and implementation of technologies that facilitate their analysis by consumers, is a current and financially impacting agenda.

The qualitative analysis enabled by heat maps indicated the areas that most attracted the individuals' attention, ratifying the fixation measurements recorded. It is thus evidenced that eye tracking provides subsidies to understanding information processing and decision-making, indicating the criteria and areas of interest that require deeper processing by the participant.

It should be noted that the objective of this study, which was to validate two purchase experimental tasks in a social commerce environment, was achieved. As a result, two decision-making tasks were validated in a social commerce environment, which showed that other consumers' recommendations, evaluations, and opinions are determining aspects of the decision to purchase different products. On the other hand, it was confirmed that the eye tracking technology is appropriate for developing experimental studies on the decision-making process, as reported by Löbler et al. (2019).

The practical implications of this investigation refer to aspects considered for decision-making in social commerce, which permeate the online purchase behavior. The development of this pilot study highlighted the search criteria used by the participants, how their virtual browsing occurs, the pre-purchase decisions, and the information sorting patterns in the purchase of different products. Therefore, subsidies are provided for managers to provide social commerce environments that meet the needs of consumers and become channels for effecting purchases, in addition to providing relevant insights for retailers regarding the efficacy of their communication and sale strategies.

In the academic field, the advanced understanding of the search for information and the purchase decision in social commerce, an online environment that counts on opinions, recommendations, and evaluations of other consumers, is highlighted in order to identify the individual and social factors that influence subjects` decision-making process. Furthermore, this investigation presents another approach when validating experimental tasks that simulate purchasing a tourist product and a durable good on social commerce websites using eye tracker equipment to analyze information processing.

A limitation of this study is in relation to the development of fictitious websites that, although similar to the actual online purchase environment, have some specificities, e.g., fiducial markers, which remind us that the task is a hypothetical situation, which can influence information processing during the task. Other limitations involve the study sample, which is non-probabilistic and selected by convenience, which implies that the results are not generalized. There was also a prevalence of women (62.5%) over men (37.5%). An aspect that should be noted is that this investigation comprises the validation of experimental tasks aiming to contribute to future investigations and is not meant to present the experiment's variables. In future studies, we suggest applying the eye tracking technique in actual purchase websites, in addition to deepening the

analyses of the metrics generated by the equipment, e.g., the duration of fixations and mapping the order of the screens visited. Furthermore, new tasks can explore the choice of other products in social commerce, aiming to verify if the visual behavior of individuals followed the same decision-making pattern.

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AUTHOR'S CONTRIBUTION

DR: proposition of the research problem and objective; conceptualization of the theme; data collection and analysis; discussion of results; article writing; suitability of the work to the journal's norms; ML: conceptualization of the theme; proposed methodology; discussion of results; and, writing of the article; MV: conceptualization of the theme; methodology development; discussion of results; and, article writing.

CONFLICTS OF INTEREST

The authors declare that there is no conflict of interest.