Swimming on the surface or diving deep: the priming effect on the breadth and depth of the online information search behavior

Autoria

Carolina Schneider Bender - carolisbender@gmail.com
Prog de Pós-Grad em Admin/Centro de Ciências Sociais Humanas – PPGA/CCSH / UFSM - Universidade Federal de Santa Maria

Mauri Leodir Lobler - lobler@ccsh.ufsm.br
Prog de Pós-Grad em Admin/Centro de Ciências Sociais Humanas – PPGA/CCSH / UFSM - Universidade Federal de Santa Maria

Eliete dos Reis Lehnhart - elietedosreis@gmail.com
Prog de Pós-Grad em Admin/Centro de Ciências Sociais Humanas – PPGA/CCSH / UFSM - Universidade Federal de Santa Maria

Resumo

Prime is a piece of information accessed before that unconsciously affects decision-making. Priming aspects to consider in the decision-making process can affect product search behavior. Past research studied information-seeking online under different approaches. Among these approaches is the breadth-depth dilemma on human behavior. This research aims to investigate how the emphasis on aspects to be considered in the purchasing decision-making process affects the subsequent information search behavior. We investigated the search behavior using an adaptation of the process-tracing research from the web. A between-subjects experiment using a scenario-based task was designed to carry out the goal of this research. A video about important aspects to consider when choosing a product - a personal computer - was used as priming. The results show that priming was affecting the breadth but not the depth of the online search. Not primed subjects used a more depth strategy, while primed ones followed a mixed breadth-depth strategy. Primed subjects made breadth switches on the second level of the website's hierarchical structure, consistent with a high elaboration and non-compensatory decision-making strategy. We also identified that priming increases the effort on the information search behavior.

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Abstract: Prime is a piece of information accessed before that unconsciously affects decision-making. Priming aspects to consider in the decision-making process can affect product search behavior. Past research studied information-seeking online under different approaches. Among these approaches is the breadth-depth dilemma on human behavior. This research aims to investigate how the emphasis on aspects to be considered in the purchasing decision-making process affects the subsequent information search behavior. We investigated the search behavior using an adaptation of the process-tracing research from the web. A between-subjects experiment using a scenario-based task was designed to carry out the goal of this research. A video about important aspects to consider when choosing a product - a personal computer - was used as priming. The results show that priming was affecting the breadth but not the depth of the online search. Not primed subjects used a more depth strategy, while primed ones followed a mixed breadth-depth strategy. Primed subjects made breadth switches on the second level of the website's hierarchical structure, consistent with a high elaboration and non-compensatory decision-making strategy. We also identified that priming increases the effort on the information search behavior.
Keywords: Information search behavior. Breadth of search. Depth of search. Priming effect. Online decision-making

Each time we start to think about a topic we became more attentive to information related to it. We may be unconsciously affected by information that can guide or teach us how to choose in these situations. This can be useful when facing a lot of similar options which increases the difficulty of finding the best course of action. Regarding purchase decisions, information like this was found in specialized magazines and TV shows in the past. Nowadays, this information is available online in paid content, specialized blogs, or reviews on YouTube that provide comments about the brands, the fit between the product/service and the consumer needs, and the specific features of the product/service that should be considered by the decision-maker.

For example, imagine you are moving soon to a new country and need to rent an apartment. The total sample of possible options can be intractable from the cognitive perspective. You should visit too many options to cover all possibilities, and this came with a cost in terms of time and effort even if you are searching online. As this topic is fresh on your working memory, you can easily face information about rental requirements, neighborhoods, and size/price ratio, among others. This can help you to reduce the number of options and makes the search process easier. However, it changes the search behavior to achieve your goal.

Information accessed before the decision-making that can affect it is named priming. A prime is a cue that can influence subsequent behavior. Priming can be activated by a concept, reminding of past experiences, background music and images, odor, temperature, and subliminal stimuli (Cohn & Maréchal, 2016). This cue induces how information is processed leading up to a choice (Kim et al., 2021; Shen & Wyer, 2008). A large body of studies tried to understand the effect of a prime on final choice or decision. However, what happens when the information search behavior is primed? How does prime information relating to the decision process affect subsequent information search behavior?

The information search perspective pursued an understanding of the relationship between the information and the cognitive process, and its consequent effect on how the decision-maker acquires and processes information (Huang et al., 2009). According to Janiszewski and Wyer (2014, p. 106), “cognitive process priming occurs when the increased accessibility of a process increases the likelihood it will be used in a subsequent task”. In line

with this, some prime information that brings pieces of advice about the decision process has the potential to affect the product/service search behavior.

If some processing-related information is easily available in the working memory, it can influence the cognitive procedure used to search for information about the product (Shen & Wyer, 2008). This influence can be in terms of the breadth or the depth of search, measured in the related literature as the variables number of acquisition and time per acquisition, respectively (Bettman et al., 1993). Approaches trying to understand this behavior in online information searching used the same measure, changing the unit of analysis for pages on a website (Huang et al., 2009).

E-commerce is no longer an incipient phenomenon. It represents an important part of the amount spent on purchase behavior. The number of digital buyers keeps climbing, reaching over two billion people who purchased goods or services online in 2020 (Statista, 2022). In a natural movement, the decision-making field has extended its borders to cover digital phenomena (Schaer & Stanoevska-Slabeva, 2019). Researchers have been trying to understand human search behavior under different aspects, among which are the breadth and the depth of search. The breadth-depth of the search was studied concerning advertisement and motives (Yang, 2004), information quality about goods (Huang et al., 2009), and the type of device used to search for information (Han et al., 2022).

This research aims to investigate how the emphasis on aspects to be considered in the purchasing decision-making process affects the subsequent information search behavior. A video about important aspects to consider when choosing a product - a personal computer - was used as priming. Our proposal uses an adaptation of the process-tracing research (Bettman et al., 1993; Payne et al., 1993) from online seeking information. The breadth of search is the number of pages visited to acquire information, and the depth of search is the ratio between time spent and the number of pages visited (Huang et al., 2009).

All decision-makers dealing with some finite resource (e.g., effort, attention, time, money) to be allocated among alternatives are facing the ubiquitous breadth-depth dilemma (Moreno-Bote et al., 2020). Despite past theoretical (Moreno-Bote et al., 2020; Moreno-Bote & Mastrogiuseppe, 2021; Ramírez-Ruiz & Moreno-Bote, 2021) and empirical (Han et al., 2022; Huang et al., 2009; Vidal et al., 2021; Yang, 2004) work developed about it, we did not found studies relating the effect of a prime in the breadth and the depth search behavior in online seeking-information. A better understanding of purchase information search behavior has been a perennial goal for decision-making researchers. Disclosing such aspects can help in the development of effective marketing strategies. On the other hand, more knowledge about the influence of a prime on the subsequent information search process can prevent individuals from having their decision-making process biased.

Theoretical background

Priming effect

Priming consists of some piece of information that influences the response to a subsequent stimulus (Janiszewski & Wyer, 2014; Laran et al., 2008). In cognitive sciences, it is usually referred to as the priming effect the situation when a stimulus activates a mental concept influencing subsequent behaviors (Kahneman, 2017). One important aspect of the priming effect is the lack of conscience of the individuals that some priming is being used to manipulate the behavior, otherwise, they usually try to correct the biasing effect (Janiszewski & Wyer, 2014).

According to Harman et al. (2020) individuals' can have their behavior primed and measures from search behavior indicate if the prime was effective (Harman et al., 2020). A prime can influence all the stages of information processing, including attention,

comprehension, memory retrieval, inference, and response generation (Janiszewski & Wyer, 2014). Thus, the information-seeking process used as the basis for judgment can also be primed (Shen & Wyer, 2008). This is consistent with the manipulation carried out in this research. Subjects were assigned or not for a condition with an emphasis on an aspect to be considered in the purchasing decision-making process. The main goal was to verify whether individuals on this condition – primed subjects – showed differences in their information search behavior.

Individual and situational factors can influence information search behavior (Yang, 2004). Kim et al. (2021) primed the consumer attitudes to investigate environmentally travel behavior using a simulated travel website. The finds indicate that priming influences environmental concerns even for those who did not view themselves as pro-environmental. With evidence that goal priming is context-dependent, Laran et al. (2008) found prime-consistent behaviors for common contexts and prime-inconsistent behaviors for uncommon contexts. Shen and Wyer (2008) used a search strategy as prime to check its effects on positively and negatively valenced product information.

We did not find research that addressed the role of priming on the breadth and the depth of search. In our experiment, the priming was a video highlighting aspect to be considered when searching for information to purchase a product. The priming was used to activate a mental representation of the mandatory information to make a good choice. This research can be characterized at the computational level (Maar, 1982) since it focuses on the behaviors elicited by exposure to a prime stimulus (Sherman et al., 2014).

Breadth and depth in information search behavior

Research on information search behavior can help to increase the knowledge of how consumers decide (Bhatnagar & Ghose, 2004). Common measures of information search behavior are the time spent and the amount of information acquired, both coming from the process-tracing research (Payne et al., 1993; Payne & Bettman, 1988). For example, the extent of the search is one of the different names used to investigate these variables (Bhatnagar & Ghose, 2004). The information search research expands its borders to cover online behavior. As result, its concepts must be adjusted according to the characteristics of this environment.

Here we use the concept of breadth versus depth of search proposed by Huang et al. (2009). The breadth of search is defined based on the number of acquisitions and represents the number of pages on a website that a consumer visited searching for information. The depth of search came from the time-per-acquisition variable, measured in the online environment as the ratio between the time spent evaluating information and the number of pages visited.

As pointed out before, no previous work on the effect of priming the breadth and the depth of search was found. Thus, the assumptions drawn for the research are general in the sense that the hypotheses do not point in a direction of the priming effect. If a prime increase the accessibility of processing-related information on the working memory, it can be concluded that the search procedure may be affected by it (Shen & Wyer, 2008). The main prediction is that priming subjects about aspects to consider in the decision-making process will affect the information search process. Using the breadth-depth proposition from Huang et al. (2009) is expected:

H_1: Priming subjects about aspects to consider in the decision-making process will affect the breadth of the search.
H_2: Priming subjects about aspects to consider in the decision-making process will affect the depth of the search.

Digital information is usually presented as a hierarchical structure (Jacko & Salvendy, 1996) and online searches and websites follow this hierarchical form. The breadth-depth of the search is related to the number of levels and the number of options per level (Geven et al., 2006; Jacko & Salvendy, 1996; Moreno-Bote & Mastrogiuseppe, 2021). In contrast with the website proposed here (see Figure 1-D), the past work used a larger tree structure with more levels and nodes per level.

Despite this limitation, it is still interesting to understand the individuals' breadth-depth behavior in the different levels of the hierarchical structure of the website designed for the research. We defend it since the features highlighted in the video were mostly on the third level of the website. Therefore, it is expected to find a difference mainly at level 3. The lower level of the hierarchical tree always had more detailed information compared to the previous one. This could also be reflected in the other levels beyond the third one, once the priming effect extends to the strategy used to acquire information (Janiszewski & Wyer, 2014; Shen & Wyer, 2008). Hypotheses were drawn for the breadth and depth of the search at each level (Figure 1D):

H_3: The priming about aspects to consider in the decision-making process will affect the breadth of the search at level 1 of the website's hierarchical structure.
H_4: The priming about aspects to consider in the decision-making process will affect the breadth of the search at level 2 of the website's hierarchical structure.
H_5: The priming about aspects to consider in the decision-making process will affect the breadth of the search at level 3 of the website's hierarchical structure.
H_6: The priming about aspects to consider in the decision-making process will affect the depth of the search at level 1 of the website's hierarchical structure.
H_7: The priming about aspects to consider in the decision-making process will affect the depth of the search at level 2 of the website's hierarchical structure.
H_8: The priming about aspects to consider in the decision-making process will affect the depth of the search at level 3 of the website's hierarchical structure.

Search online makes the process of finding information easier, especially in purchasing decisions. Some authors refer to the online purchase environment as low cost. Although it is true in comparison to offline purchasing, online search behavior can cost too much in terms of time and cognitive effort, given the huge amount of information available. Facing a cognitive overload, individuals may overlook key information or obtain inaccurate data (Roscoe et al., 2016). These effects can be minimized with the decision strategy used by individuals (İltüzer & Demiraslan Çevik, 2021; Kwon et al., 2018; Payne & Bettman, 1988) as a way to compensate for the difficulties imposed by the characteristics of the decision-making environment.

The strategy can be identified by the subject's behavior when searching for the relevant information to reach a decision. Although hypotheses regarding the decision strategy used by the subjects are not drawn, it is relevant to understand whether the subjects' behavior will be closer to any of the common decision-making strategies (Kwon et al., 2018). Furthermore, the effort put when searching for information to decide can be inferred using the time spent on the process (Li et al., 2013; Zafar et al., 2021).

Methods

Experiment design and manipulation

An experiment was designed to carry out the objective of this research. The experiment used a between-subject design to examine the effect of a prime on information search behavior. The independent variable manipulated was a video. Subjects were randomly assigned to one of

the two experimental conditions: the presence of priming (*PRIMING_1*) or the absence of priming (*PRIMING_0*). The video highlighted the main important aspects to consider when choosing a computer (e.g., main features to consider, fit between consumer needs, type of use, and product).

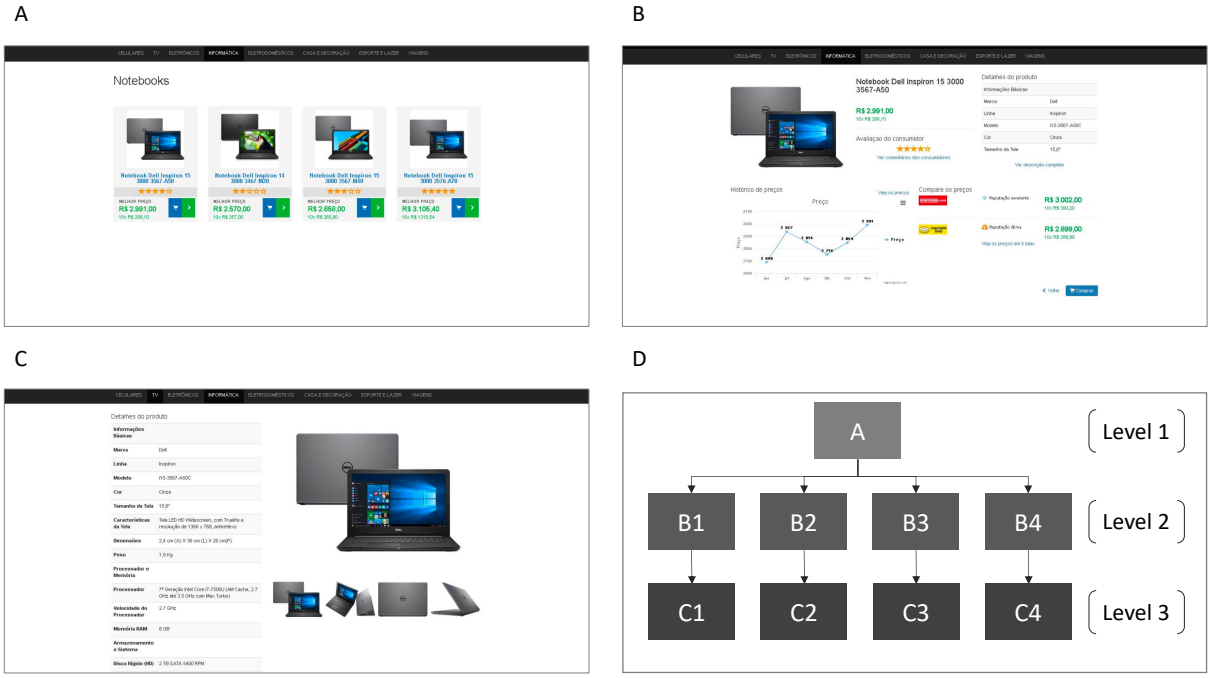
To examine the effect of the independent variable on subsequent information search behavior the study employed a scenario-based task to reduce non-naturalistic settings (Yang, 2004). We tried to make a task as real as possible. Before the task subjects were instructed to imagine they received a government incentive to buy a computer for the academic year. The experimental task was to choose a computer on a website. The amount of money covers all available options.

A website was designed to simulate ordinary online shopping websites from Brazil. We intended to induce a high involvement with the task by using imagination and scenarios. Subjects could freely browse the website. All options were from the same brand to reduce its influence on the task. The website had information about the models, pictures of the products, tech specs (e.g., processor, display, memory, hard drive, color), prices, payment conditions, and online product recommendations from buyers. We took all information from real purchase websites. Participants could decide the way to allocate their resources since there was no time limitation to do the task.

The first website page (Figure 1-A) showed the four computer options together, which represents the first level of the website (Figure 1-D).

Figure 1

Example of website pages and structure



Note: **A**: First level page with 4 computer options and little information about each alternative; **B**: Example of one page from the second level presenting more information regarding decision-making criteria such as price, characteristic, pictures, and evaluation of the product; **C:** Example of the third level page with detailed information about tech specs; and **D:** Hierarchical structure of the website. A lower level of the hierarchical structure always had more detailed information compared to the previous level. Most parts of the information highlighted on the prime were at Level 3.

By clicking on one of the options, subjects were redirected to a new page where they could find more detailed information about the computer (Figure 1-B). At that point, they would be on the second level of the website (Figure 1-D). In the third level (Figure 1-D), subjects could get more detailed information about the aspects highlighted in the video (Figure 1-C).

Dependent measures

The variables adapted from the process-tracing research were used to detect how a prime about aspects to consider in the purchasing decision-making affects the subsequent breadth-depth information search behavior. The time per acquisition is the time spent acquiring information divided by the attribute values. While the number of acquisitions is the number of times that an attribute is visited (Bettman et al., 1993; Huang et al., 2009; Payne et al., 1993). Following Huang et al. (2009) the dependent measures defined for the experiment were the breadth and the depth of search.

The breadth of search is the number of acquisitions, represented by the total number of pages visited (*TOTAL_PAG_VIS*). In our experimental context, this dependent variable can be understood as the number of times the subjects switch from one page to another looking for new information or revisiting information. The depth of search is similar to time per acquisition, representing the total time spent on the information search task divided by the number of pages visited (*TIME_RATIO_PAG*). This variable derives from the total time searching information (*TOTAL_TIME*) in seconds, which can be a predictor of the search effort (Li et al., 2013; Zafar et al., 2021). For this research, the three variables are considered general information search behavior.

The website follows a hierarchical structure that can be defined as levels in a tree structure (Figure 1-D). The definition from the hierarchical variables is the same used for the previous variables. The breadth of search in one level refers to the number of pages visited at that specific level (*PAG_VIS_LEV1*, *PAG_VIS_LEV2*, and *PAG_VIS_LEV3*). The depth of search is the time spent on that level divided by the number of pages visited (*TIME_RATIO_PAG_LEV1*; *TIME_RATIO_PAG_LEV2*; *TIME_RATIO_PAG_LEV3*). Again, the time spent on each level was measured (TIME_LEV1; TIME_LEV2; TIME_LEV3). These variables about the hierarchical levels of the site are considered hierarchical information search behavior for this research. Table 1 presents a summary of the dependent variables.

Table 1

Summary of dependent variables

Dependent variable	Description	Meaning	Source
TOTAL_PAG_VIS	Total number of pages visited	Breadth of search	(Bettman et al., 1993; Huang et al., 2009; Payne et al., 1993)
PAG_VIS_LEV1	Number of pages visited at level 1		
PAG_VIS_LEV2	Number of pages visited at level 2		
PAG_VIS_LEV3	Number of pages visited at level 3		
TIME_RATIO_PAG	Total time searching information divided by the number of pages visited	Depth of search	
TIME_RATIO_PAG_LEV1	Time at level 1 divided by the number of pages visited at level 1		
TIME_RATIO_PAG_LEV2	Time at level 2 divided by the number of pages visited at level 2		
TIME_RATIO_PAG_LEV3	Time at level 3 divided by the number of pages visited at level 3		
TOTAL_TIME	Total time spent searching information	Search effort	(Li et al., 2013; Zafar et al., 2021)
TIME_LEV1	Time spent searching information at level 1		
TIME_LEV2	Time spent searching information at level 2		
TIME_LEV3	Time spent searching information at level 3		

Participants

A sample of 57 college students (M_{age}= 22.44; Female = 52.63%; Male = 47.37%) from a large public university was recruited from undergraduate classes. The only criteria to participate were to have made purchases online or searched for information about products/services online. We asked whether participants intended to buy a computer or had purchased one in the last 6 months (No = 71.18%; Yes = 29.82%). We used this question to access if they had recent information which could affect the information search process. We mapped subjects who had answered yes, and we did not find strong behavioral differences. The sample has previous experience in online search information, as 59.65% responded they always look for information online before making a purchase (28.07% answered that they often search for information online; 12.28% answered sometimes).

The data was collected at a laboratory, using a computer, a mouse, and a screen. Participants met individually with the experimenter in the laboratory space. After subjects signed the consent form, the experimenter clarified all questions about the research and gave them the instructions to perform the task.

In a first inspection of the sample data (30 subjects for *PRIMING_1* condition; 27 subjects for *PRIMING_0* condition), we identified one outlier in the *PRIMING_0* group. We considered it an outlier because of its abnormal behavior in more than half of the dependent measures. We decided to exclude it. The final sample from the data analysis was 56 subjects (30 for *PRIMING_1*; 26 for *PRIMING_0*). The *Universidade Federal de Santa Maria* ethics committee approved this research.

Analyses and control

Analyses were run using R. The normality of the data was tested using the Shapiro tests and homoscedasticity was tested using F tests. We decided to use non-parametric tests since the data was mostly non-normal. Two different orders (*LAYOUT_TYPE1* vs. *LAYOUT_TYPE2*) were set up as a between-subjects condition at level 1 of the website hierarchy to control some possible effects of the presentation order of the search options. We did not find an effect of the presentation order on information search behavior (Mann-Whitney$_{TOTAL_PAG_VIS}$: W = 352.5, p-value = 0.5269 – m_{LAYOUT_TYPE1} = 14.00, m_{LAYOUT_TYPE2} = 15.00; Mann-Whitney$_{TIME_RATIO_PAG}$: W = 319, p-value = 0.2398 – m_{LAYOUT_TYPE1} = 11.56, m_{LAYOUT_TYPE2} = 12.55) or product choice. Based on it then both order conditions were analyzed combined in the next sections.

Results

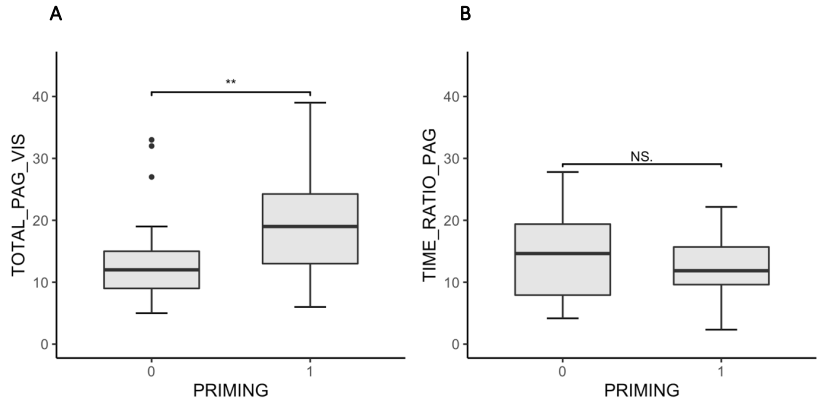
The priming affected the breadth but not the depth of search

The first focus of the data analysis was on the effect of the prime on breadth-depth behavior across the task. This refers to H_1 and H_2, and dependent variables *TOTAL_PAG_VIS* and *TIME_RATIO_PAG*, respectively. Mann-Whitney test shows a significant effect of the priming in the variable total number of pages visited (W = 231, p-value = 0.009056), supporting H_1, which proposed that priming would affect the number of pages visited. The effect size of the independent variable was moderate (r = 0.350) (Fritz et al., 2012). The likelihood of a person from the priming group chosen by chance having the highest value for the dependent variable than a person chosen by chance from the group without priming is 70.38% according to the common language effect size (Kerby, 2014). No significant effect was found for the variable

measured by the ratio between total time spent and the total number of pages visited (W = 441, p-value = 0.4067). Therefore, H_2 was not supported. Figure 2 presents the results.

Figure 2

Boxplot for H_1 and H_2 (Mann-Whitney test)



Note: **A**: Boxplot for H_1 ($m_{PRIMING\_0}$ = 12.000, $m_{PRIMING\_1}$ = 19.000); **B**: Boxplot for H_2 ($m_{PRIMING\_0}$ = 14.632, $m_{PRIMING\_1}$ = 11.855). Priming only had a significant effect on the total number of pages visited. Dots represent outliers, strong black lines represent medians of each group. Results of Mann-Whitney tests are displayed according to adjusted p-values ('NS': $p > 0.05$, '**': $p < 0.001$).

The results show that subjects who saw the priming performed the task differently than subjects who won't see it in terms of breadth of search. The prime affected subsequent information search behavior for the variable number of acquisitions. Primed subjects visited more pages to acquire all the information needed to make a decision. On the other side, depth was not affected by the priming. On the process tracing, this means that no differences were found in time per acquisition.

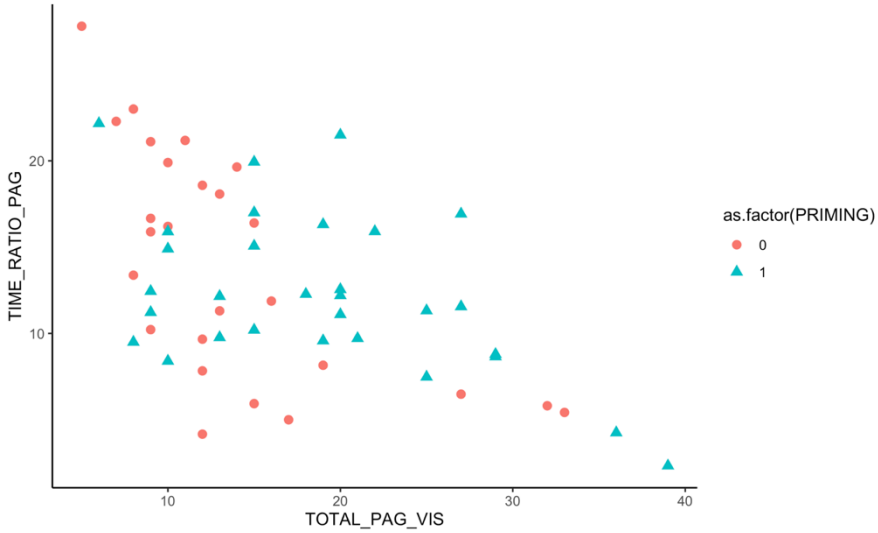
Yang (2004) analyzed the influence of advertising appeals on consumer search behavior and he did not find significant differences in the sample for the depth of search (F = 1.719, p = 0.193) and the breadth of search (F = 1.689, p = 0.197). In contrast to these results and our results, Huang et al. (2009) found a significant difference in the depth of online search (F (1, 180 = 4.89, $p < 0.05$). The authors investigated the information search behavior for experience and search goods. Consumers of experience goods spent 19.5% more time per page. Besides testing different independent variables, the main difference between the experiment carried out in our research and the one from Huang et al. (2009) is that their participants performed the task in a real-life environment. They searched for information on search engines, which explains the different results since in our research fewer samples were available to acquire information.

Figure 3 shows the *TOTAL_PAG_VIS* (x-axis) and the *TIME_RATIO_PAGE* (y-axis) plotted as a factor of the *PRIMING* condition. The y-axis dominating over the x-axis refers to a more depth strategy, represented by more points close to the y-axis. On the other side, a more breadth strategy is represented by more participants close to the x-axis. Each point/triangle represents one subject.

From visual inspection, it can be observed great variability in the breadth-depth strategy of the data set. It is hard to predict the main strategy adopted by participants on each condition of the independent variable. But, on the *PRIMING_0* most of the orange points are in the region from the smallest numbers of x and close to the y-axis compared to *PRIMING_1* subjects, which represents a strategy inclined from depth. Nonetheless, green triangles (*PRIMING_1*) are much more spread across the plot, which can characterize a mixed breadth-depth strategy.

Figure 3

Plot for acquisition time vs. number of acquisitions for each subject



Note: Plot for TIME_RATIO_PAG~TOTAL_PAG_VIS. PRIMING_0 condition subjects tend to a more depth strategy in comparison with the PRIMING_1 condition group, which adopted a mixed breadth-depth strategy. Dots and triangles represent subjects. The orange represents the PRIMING_0 condition and the green represents the PRIMING_1 condition.

Prime does not affect the depth of search according to the Mann-Whitney test. But, at the same time, the group *PRIMING_0* seems to perform the task using a more inclined to depth strategy. The question that arises from the results is: did priming lead to a breadth strategy, or do individuals generally use a depth strategy for online purchase decision-making?

In our data, it was not possible to test if a prime led subjects to a tradeoff between breadth-depth (Ramírez-Ruiz & Moreno-Bote, 2021; Vidal et al., 2021). First, to perform it is necessary to manipulate some variable related to the capacity (in our task could have been time to make the decision). Moreover, our experimental design had 4 options, which represent few alternatives to sample information.

Consistent with our results, previous research found a breadth-depth balance. Vidal et al. (2021) developed a gamified experimental task to confront individuals with a breadth-depth dilemma. The task involves uncertainty and limited resources in multi-alternative decision-making. The results of Vidal et al. (2021) show participants following a pure-breadth strategy in low capacity, whilst at larger capacities, they switch to a mixed strategy, sampling information according to a trade-off between breadth and depth.

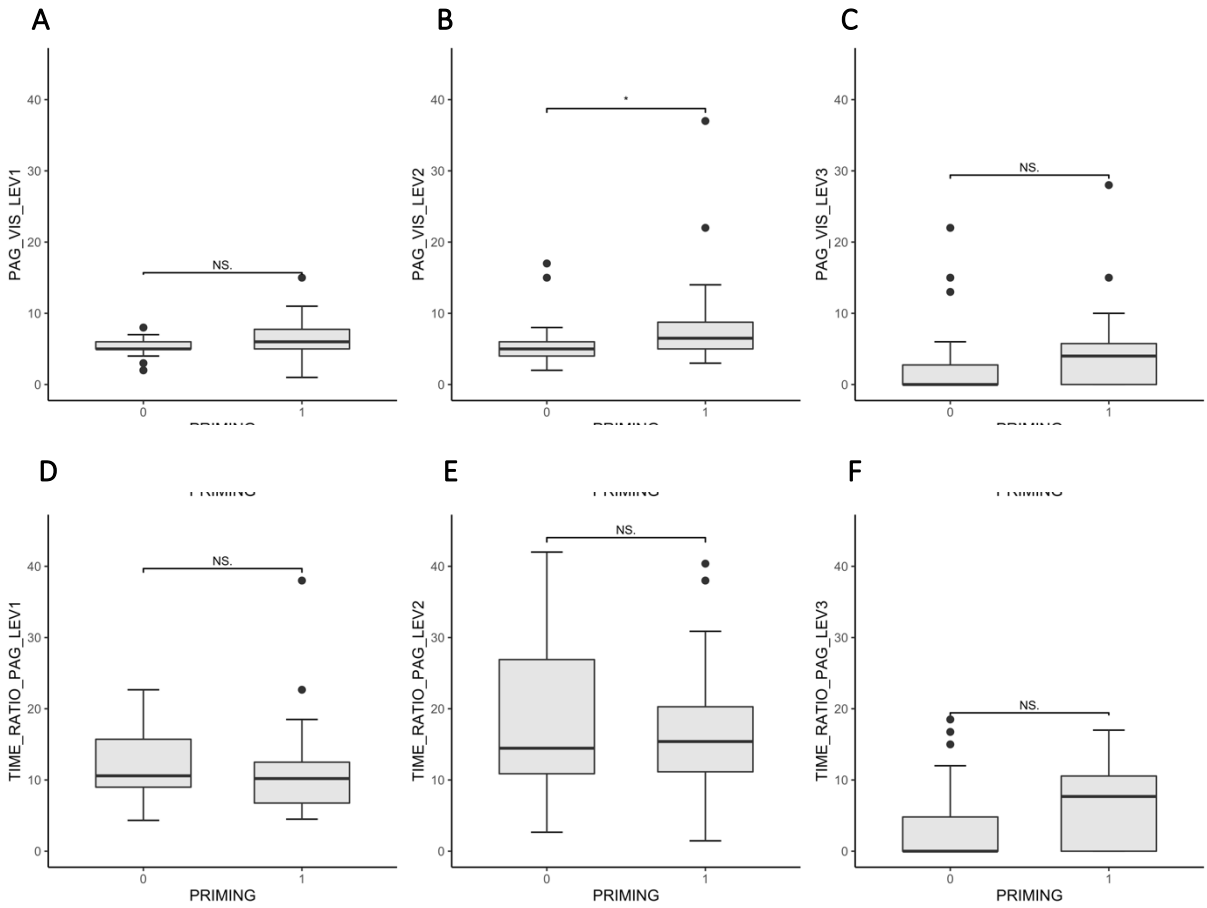
The priming leads individuals to switch more between pages at level 2 in a breadth way

Considering the structure of the website as a way of understanding how deep subjects went looking for information, we proposed to check the effect of the prime on the hierarchical information search behavior. This refers to hypothesis H_3 until H_8. The lower levels of the website tree structure (represented in Figure 1-D) contain more detailed information about the tech specs. The prediction was that subjects in the *PRIMING_1* condition would visit more pages at level 3 since the primed information on the video was mainly at this level.

Regarding the number of pages visited, the Mann-Whitney test shows a significant effect of the prime only at level 2 (W = 243.5, p-value = 0.01493). The effect size of the priming on the breadth of search in level 2 has a medium magnitude (r = 0.326), according to Fritz et al. (2012). The common language effect size (Kerby, 2014) was 68.78%. It was not found significant effect on the prime in the number of acquisitions in level 1 (W = 313, p-value = 0.2006) and level 3 (W = 289.5, p-value = 0.0786). Therefore, the results support H_4 but do not support H_3 and H_5. All hypotheses about the time per acquisition under the hierarchical structure analysis were not supported (H_6: W = 450, p-value = 0.3282; H_7: W = 418.5, p-value = 0.6455; H_8: W = 296.5, p-value = 0.1024). Figure 4 presents the plots for the hypothesis test.

Figure 4

Boxplot for H_3 to H_8 (Mann-Whitney test)



Note: **A**: Boxplot for H_3 ($m_{PRIMING\_0}$ = 5.000, $m_{PRIMING\_1}$ = 5.000); **B**: Boxplot for H_4 ($m_{PRIMING\_0}$ = 5.000, $m_{PRIMING\_1}$ = 6.500); **C**: Boxplot for H_5 ($m_{PRIMING\_0}$ = 2.769, $m_{PRIMING\_1}$ = 4.000); **D**: Boxplot for H_6 ($m_{PRIMING\_0}$ = 10.588, $m_{PRIMING\_1}$ = 10.200); **E**: Boxplot for H_7 ($m_{PRIMING\_0}$ = 14.458, $m_{PRIMING\_1}$ = 15.400); and **F**: Boxplot for H_8 ($m_{PRIMING\_0}$ = 7.683, $m_{PRIMING\_1}$ = 0.000). Priming only significantly affected the number of pages visited on level 2. Dots represent outliers, strong black lines represent medians of each group. Results of Mann-Whitney tests are displayed according to adjusted p-values ('NS': p>0.05, '*': p<0.05).

The results again show differences in the breadth of the search. The prediction was that subjects who received different treatments of the independent variable would differ in the search for information behavior on the third level. Subjects could find in detail the main aspects highlighted in the video could at level 3 of the website hierarchy. But our results indicated the difference between conditions only on the number of pages that subjects visited at level 2.

Subjects on the *PRIMING_1* condition switched more between options at level 2 to acquire information for each product and then compare information between them.

The main purpose of this research was not to identify the decision-making strategy used. Notwithstanding, interestingly, the number of pages visited at level 2 is higher for *PRIMING_1* subjects while no difference was found for the dependent variable *TIME_RATIO_PAG*. These findings denote that these individuals moved quickly from one computer's page to another as a way to compare and check the best options. This result goes in the same line as a discussion proposed by Huang et al. (2009). According to the authors information about standard product specifications requires less time to be obtained and processed.

This behavior can be classified as the elimination-by-aspects rule (EBA). EBA is a high elaboration and attributed focus strategy (Kwon et al., 2018) characterized by a non-compensatory behavior and qualitative search (İltüzer & Demiraslan Çevik, 2021). According to Kwon et al. (2018), other common consumer strategies are lexicographic (LEX) from low elaboration and attribute-based information search, satisficing (SAT) represented by low elaboration and alternative focus, and weighted adding (WAD) from high elaboration and alternative focused information-seeking.

The priming increases the effort on the information search behavior

We did not draw a hypothesis about the time spent since the process-tracing research uses the time per acquisition variable, a ratio between time spent and attributes visited, as the depth of search. Following previous research (Huang et al., 2009), pages were used rather than attribute values as the unit of analysis. Nevertheless, time *per se* is an important descriptor of information-seeking behavior related to the quantity of capacity devoted to each page visited. Research on search behavior considers that the amount of time spent searching information describes the effort put into the search process (Li et al., 2013; Zafar et al., 2021).

The effect of the priming condition (PRIMING_0 vs. PRIMING_1) was tested with respect to the time spent in information search (*TOTAL_TIME*) and time spent on level 1 (*TIME_LEV1*), level 2 (*TIME_LEV2*), and level 3 (*TIME_LEV3*) of the website hierarchy. Differences were found between both conditions of the independent variable on the *TOTAL_TIME* (W = 267, p-value = 0.04415) and *TIME_LEV3* (W = 265, p-value = 0.02877) with small magnitude ($r_{TOTAL\text{-}TIME}$= 0.270; r_{TIME_LEV3}= 0.293). No differences were found for *TIME_LEV1* (W = 380, p-value = 0.8759) and *TIME_LEV2* (W = 301.5, p-value = 0.1482). All plots are in Figure 5.

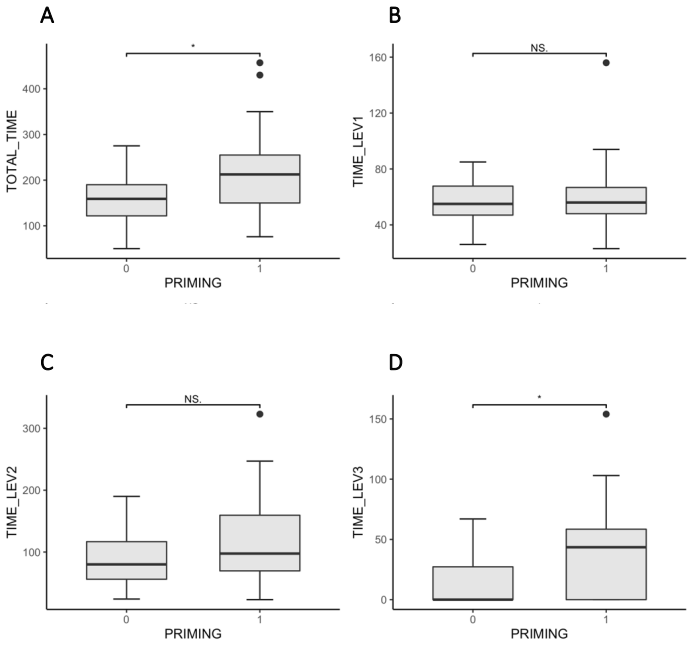
Subjects in the *PRIMING_1* condition present a higher median in comparison with other subjects. More time spent represents more effort put into the information-seeking process, consistent with the previous discussion about the decision-making strategy. *PRIMING_1* subjects seem more inclined to follow a high elaboration strategy (the EBA rule) and can be inferred that their search process was more effortful in comparison with *PRIMING_0* subjects.

The analyses of the previous session were surprising since no difference was found in level 3. The prediction was that the treatment of the independent variable would result in differences at this level, as the priming information-related should push the search process there. The rejection of H_5 and H_8 brought evidence that the prime did not affect the third hierarchical level's breadth or depth of search. Conversely, the presence of priming showed an effect of small magnitude on the effort put by subjects searching for information on level 3. If priming did not affect the breadth-depth of the search on this level, it may have affected the subjects' commitment to searching for the best option given the information highlighted in the video. The results seem reasonable since the search effort put into a task is related to individuals' perception of the costs and benefits of making that effort (Zafar et al., 2021). Thus, the explanations about the aspects that should be considered to make a good decision led the

subjects to put more effort into understanding the information related to it, which could be found in the third level of the website hierarchy.

Figure 5

Boxplot for variables related to the time spent as a factor of the priming (Mann-Whitney test)



Note: **A**: Boxplot for the total time spent as a factor of priming condition ($m_{PRIMING\_0}$ = 159.000, $m_{PRIMING\_1}$ = 214.500); **B**: Boxplot for time spent at level 1 as a factor of priming condition ($m_{PRIMING\_0}$ = 55.000, $m_{PRIMING\_1}$ = 56.000); **C**: Boxplot for time spent at level 2 as a factor of priming condition ($m_{PRIMING\_0}$ = 80.000, $m_{PRIMING\_1}$ = 97.500); and **D**: Boxplot for time spent at level 3 as a factor of priming condition ($m_{PRIMING\_0}$ = 0.000, $m_{PRIMING\_1}$ = 43.500). Priming significantly affected the total time searching information and time spent searching information at level 3. Dots represent outliers, strong black lines represent medians of each group. Results of Mann-Whitney tests are displayed according to adjusted p-values ('NS': p>0.05, '*': p<0.05).

Conclusions

Looking for information superficially can limit our ability to distinguish the best options, since we can have insufficient data. On the opposite side, search information available online can overload our limited resources to deal with all information, which can be intractable from the cognitive perspective (Maar, 1982; Roscoe et al., 2016; Vidal et al., 2021). This research investigates the effects of priming on subsequent information search behavior. Setting an experimental design with a prime about aspects to take into consideration to buying a new computer allowed to examine search patterns in terms of breadth and depth of search.

The priming affected the breadth of the online search, but not the depth of the online search. The number of acquisitions – measured here as the number of pages visited – was greater among subjects who saw the video about aspects to consider making a good decision (H_1 was supported). The priming did not affect the ratio between time spent and the number of pages visited (H_2 was not supported).

Nevertheless, *PRIMING_0* subjects seem to use a more depth strategy while *PRIMING_1* subjects followed a mixed breadth-depth strategy. A limitation of our study is the absence of manipulation in some capacity variable since the time available to make the decision

was self-paced by subjects. Without it, we cannot have full control of the capacity effect on the dilemma between following a breadth or a depth strategy(Jacko & Salvendy, 1996; Ramírez-Ruiz & Moreno-Bote, 2021; Vidal et al., 2021).

The website's hierarchical structure showed the priming leads subjects to switch more between pages at level 2 in a breadth way (H_4 was supported), consistently with a high elaboration and non-compensatory decision strategy. No significant effect on the number of pages visited was found for other levels, and also from the depth of search. Both, this and previous results, showed that the main effect of the priming was on the breadth of the search. The common decision-making strategy (Kwon et al., 2018) EBA was used to make quick comparisons between available options.

We also identified that priming increases the effort on the information search behavior, supported by the tests with the total time spent searching information and total time spent on level 3. Priming some aspects that must be considered to make a good decision led subjects to put more effort into the search for information on the level of the website structure where this information was available. While in general the primed subjects followed a mixed breadth-depth strategy, at level 2 the behavior was that of switching more seeking and revisiting information. The differences in the effort exerted in processing information at level 3 reinforce this behavior, once the variable time is a component of the time per acquisition. The primed subjects performed more breadth but, at the same time, they searched for the indicated information and spent their resources (time and cognitive effort) to understand it.

This study has an exploratory complexion since we did not find previous studies relating to the variables addressed here. In addition to the limitations already mentioned, the challenge of identifying the mental concept activated by a prime should be pointed out. One weakness of this work was the between-subjects design, which makes it difficult to confirm whether our results are effects of priming or just individual differences among groups. We tried to control it as much as possible while experimenting. In addition, our website was designed with just 4 options of the product, which brings a strong limitation on the search behavior and breadth-depth dilemma analysis. We suggest that future research is carried out on a larger hierarchical website or even using naturalistic environments, such as the free search on search engines. A within-subjects design can be used to clarify such aspects of the effect of priming on information-seeking behavior.

Future research can be designed in a way to consider the hierarchical transitions between levels and manipulate the subject's capacity on sampling information (i.e., time available) to pursue a better understanding of the individuals' breadth-depth dilemma in face of online search information. The prime condition can also be improved by adding groups that watch a video that mentions other decision criteria, such as price or consumer recommendations. This is a limitation of the present research since there was only one primed group. Research about the relationship between the priming and the decision-making strategy used can help to develop marketing strategies.

From a theoretical perspective, this study demonstrated the potential of a video as priming the subsequent information search behavior. Our results showed the importance of prime guiding search behavior on the breadth of search. From a managerial perspective, this study guides online shopping, website developers, and advertisers, since videos like the one used here are common and easily accessible. We showed the unconscious effect of telling people which kind of information they must look have on the effort put into searching for the related information. Future research could extend these results to other products and services.

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