Consumers Behavior with Information-Processing Capacity Constraints

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Abstract

This study analyzes consumer behavior to highlight the intervening processes and factors in the decision-making process, taking as a reference the act of purchase. The contribution of this paper is to approach representative concepts for analytical purposes on decision making processes and advance in the analysis of the limited capacity consumer. We show decisions and preferences of the same purchase are not constant over time, and instead are the outcome of a complex process, affected by circumstances and environmental factors that take place in a given time. With a focus on the reasoning ability underlying the purchase decision, a flow diagram was designed to represent a type of limited information processing model. Then, according to the theoretical framework of Rubinstein (1998), we introduce a model for an agent with limited capacity in the of processing of information. The model has a variant on the structure of consumer information 'brand effect' and supposes loss aversion "effect minimum satisfaction".
Keywords: Consumer Behavior, bounded rationality, information processing theory, making decision, preference of the consumer.

1. Introduction

This paper provides an analysis of the behavior of a consumer and restrictions on the ability of information processing. It discusses the relevance of considering an individual as being efficient in decision-making to approach concepts that are most representative for analytical purposes in decision-making processes to ultimately discuss the limited capacity of the consumer.

The framework of analysis is through the various theoretical approaches to learning, behavior, bounded rationality and information processing. Such questions arise as to which principles respond to the method of reasoning, to the customs of reasoning? Vices and shortcuts, or the law of least effort?

The analysis addresses the following questions: What are objectives of maximization? Is there a convergence of aims of maximization? What are the incentives for the maximization of objectives? What factors influence the processing of the information of the economic agent (consumer)?

The work consists of five parts. The following section provides an analysis of the existing literature on bounded rationality and decision-making models. The section also discusses their contributions. The third section elaborates on the analysis of information processing. The fourth section presents an analysis of the process of the purchase decision and a flowchart that shows the internal and external processes and the factors involved in the act of purchase. Finally, we present a model of the envelope of a "Consumer" with bounded rationality and constraints on the processing of information. Finally, the conclusions are presented.

2. Theoretical framework

With the aim of offering a clear statement, we start by analyzing different theoretical approaches from cognitive psychology, behavioral economics and bounded rationality to ultimately address the useful concepts in order to advance the analysis of the limitations in the capacity of information processing in the consumption decision. We will use different denominations as synonyms of our subject. They can be named as individual, consumer, economic agent, decision maker, or socio economic actor.

The motivation of this work is to show how preferences and decisions of agents could not be constant over time, and instead, change according to the circumstances or the way that these motivations and the decision are presented in relation to the processing of information. We emphasize the use of new concepts in order to analytically contribute to the development of a new paradigm on decision-making, starting from the revision of contributions and analytical contributions for purposes of determining the fundamental aspects that remain and that would deepen the development of new theoretical contributions.

We begin by analyzing the act of purchase. We assert that belonging to it is a decision-making process

that is complex but limited by the capacity of the information processing and biases of the agent, among other factors. Assuming that the individual has an unlimited capacity to analyze information, whose decision to consume - their preferences - pursues objectives of maximizing utility subject to its budgetary constraint. We further assume an economic agent whose behavior is the closest to a set of intelligent algorithms of machine learning optimization, and is zero-sum. When the agent decides, its action is the result of a complex process that takes place in a moment of time.   In addition, external constraints, such as the variable budget, value (prices of goods), and time, influence internal factors that have to do with the experience, perception, cognitive biases, processing of information, etc., being not minor matters in understanding that the agent infers and decides on its universe and operating restrictions.

Suppose the economic agent has the capability of scientific analysis, making efficient use of all available information, defined metaphorically by Heider (1958) as a "scientific" man. It is acceptance aware consent continuing to make use of a concept with null representation. In fact, this slows the development of new analysis, where one has a tendency towards a greater explanatory ability and representativeness of the actual behavior of individuals.

From the perspective of cognitive psychology, since the ´80s, new studies on limitations in cognitive processes have boomed, widening their explanatory ability, giving way to a new paradigm of analysis in decision making. Herbert Simon (1955) introduced the idea of bounded rationality; the individual has cognitive limitations. His contributions generated a new paradigm in the analysis of decision making, which contain concepts from psychology and economics.

Bounded rationality poses a different perspective to the decision-making process. It represents an individual with imperfect information and uncertainty, whose decision-making process is rational but within its constraints. These limitations where the decision-maker is immersed are his environment and his mental process. He has neither a perfect structure of preferences nor a complete calculation capacity and affecting factors such as experience, memory, perception, beliefs and personal sensitivity. This approach assumes that it is impossible for the agent to check all the available alternatives. Therefore, he does not reach an optimal (optimal decision) but a solution that is about the limited perception that he or she possesses; its relative reality. Simon assumes that an individual adapts to his environment, a working memory capacity that is not infinite, collects partial information - which he considers relevant - and that uses simple rules and short causality.

This new approach recognizes that cognitive and non-cognitive factors limit rationality. Following the literature, cognitive factors include the limitations of memory and perception in decision-making. The storage and recovery of information are through a selection process (which depends on the impact and interest of the individual). In the phase of information retrieval, problems can occur regarding quality recovery. Franco (1999) indicates that deformation can occur regarding facts, and be influenced by interests, prejudices, experiences. Also, the process of perception is based on the collection of habits, customs, types of clothing, and norms of behavior, among others. From different analytical approaches, the culture was understood as topical (includes a list of categories), historical (as social inheritance), and mental (complex ideas and habits). Also, it was understood as structural (patterned and interrelated symbols) and symbolic (meanings that are shared by a society). We can clearly see how this factor undertakes, to a greater or lesser extent, the act of an individual decision.

The individual also follows moral rules, which are selected in an evolutionary process, which respond to a tacitly agreed upon social thought. Guth and others (1982) present an experiment in which this kind of cultural behavior pattern in decision-making occurs.

For a moment, let us focus in the case of the existence of social norm. From sociology, social norm is understood as "something" with real effects on the behavior of individuals. In this sense, Durkheim characterizes the social norm as "States of things that oppose the efforts of individuals and can exert on the same external coercion". Vanberg (1999) notes that it is not the existence of the rule per se - as rule or prescribing behavior — but the validity of the standard which should be seen as ' something" with real influences on behavior, which would highlight certain regularities of the same.Compliance with the social norm is warranted by the cost of sanctioning the deviation in behavior action. The above statement refers to what the individual pursues rules governing particular morals and social order.

Against this system of pre-established values and beliefs, the agent's response is adaptive; he does not call those into question. Individuals adopt them because they look to the results as measured in terms of the benefits it can provide to them. Also, their decision-making process has variable accounts of "time" and in the latter sense, often behaviors favors that adverse to risk. Measured in an abstract way, the "deviation" is more expensive. Therefore, it is advantageous to use the belief systems provided to him; in the worst of cases, results are considered extrapolation feasible. It fails to account, the terms of the framework (Kahneman, 2011) and own characterizations of events. Similarly, emotions, social learning and imitation are models of search in the information processing conditions.

Simon proposed an adaptive search pattern. Through the adaptive learning process, models show that the individual performs a selective search through heuristics to identify patterns, finally arriving at not optimum yet satisfactory conclusions. However, that allows examining all the alternatives available.   The characteristics of an adaptive model consist of simple rules that work well under the restrictions of limited

search, knowledge and time. The heuristic, directed by motivations, are fast, useful, adaptable to particular, past or present, physical or social media. It uses the information structure of the environment.

The concept of bounded rationality founded a new approach to the theory of decision-making. Von Neumann and Morgenstern (1947) worked in decision-making with an uncertainty via axioms that determine the preferences on the model of who makes a rational decision through the individual's expected utility theorem.

Artificial intelligence also arises - going a little further - from attempts to explain how we make decisions. One of the approaches proposed by Newel and Simon through the construction of intelligent entities tries to represent the theory of rationality in decision making.

Continuing with our analysis, initial studies of Kahneman and Tversky (1972, 1973) have also highlighted the cognitive limitations of individuals. They suggested that they make use of reasoning, heuristic strategies in both the analysis of the situation and the decision-making. In this sense, when the individual is discussed in reality, it sets judgments of the probability of occurrence of an event. But in this estimation process, incurred biases that respond to heuristics that can be defined as rules or guiding principles to process or transform information for solving problems or setting up a trial. These authors showed that individuals seem to follow two rules: heuristic of "representativeness" and "availability".

Kahneman and Tversky (1979) provide an analysis of the rational decision-making model. Perspectives theory emphasizes the points underlying the decision and, therefore, is the point from which options are evaluated. A previous state determines a reference state with respect to which losses and gains are evaluated. They denote three cognitive aspects that make up the theory, which are common in many automatic processes of perception, judgment and emotion. First, the assessment is about a reference point neutral that occasionally comes in turn referred to as a level of adaptation. In the Act of purchase, a decision could be made by the satisfaction that is expected to provide a certain product consumption expenditure. Second, the principle of reduced sensitivity in the evaluation changes in our heritage. Third, the beginning of loss aversion results in an asymmetry of the power of expectations. In each option, we have the opportunity to win or lose something, and that determines our decisions on this matter. For example, assume one wants to buy a product, and does not know anything about it. There is one product for $100 and another for $150. Assuming one does not have budget restriction, one probably would decide to buy the more expensive product. Why? Well, because it could turn out to be a well-known brand and through a process of association, one can quickly believe that it will provide the satisfaction needed. The psychological cost to obtain a product that we think cannot satisfy our desire (the $100 product) is greater than the other one, which one believes assures a "minimum of satisfaction". The cost is $100; it is so much that one has ensured a minimum of satisfaction by buying another product. There is a tendency to choose the product that provides a minimum security of satisfaction!

In the case of the decision in the act of purchase, not all consumers tend to maximize utility (happiness), but they tend to achieve acceptable levels of satisfaction (Simon, 1955). In this sense, there are two issues; the first one is that there are segments of consumers with different levels of satisfaction and the other is about relaxing the assumption of rationality. Further, the cost of the product search, the influence of the environment, socio-cultural variables (family, social class, culture), and the variables generated by enterprises (marketing), among others, are external factors that affect the information processing.

There are several lines of research, and even from other disciplines such as biology, seeking to capture through models of bounded rationality. Dawkins (1976) from the evolutionary approach to optimization argues that the principles of biological evolution may apply to cultural evolution whose "memes" transmission mechanisms would be imitation and education. Holland (1975) develops genetic algorithms and technical heuristic search. Disturbances of rationality models and refinement equilibrium models were featured by Selten (1975), Kohlberg and Mertens (1986), Kreps, Milgrom, Roberts and Wilson (1982), Radner (1980). Automata models developed by Neyman (1985) and Rubinstein (1986), among others, represent the decision-making body as pre-programmed with a limited computing capacity.

In this work, on the basis of modeling offered by Rubinstein (1998), a model of the limited capacity of consumer information processing with news variants is developed.

3. Information Processing

Limited capacity of information processing

In this section, following the existing literature, we will emphasize the accuracy of individual reasoning ability.

In any analysis of reality, one of the fundamental methodological processes that arise is called the covariance, which is the comparison of two events to establish a causal relationship. Another relationship that occurs in the processing of information is among their responses and environmental events. In the first case, many studies showed that individuals do not perform precisely this kind of analysis, there is a propensity to commit systematic errors leading to biases. Through numerous experiments, Kelley (1967) analyzed how individuals set judgments between two events and found that they do make not only full use of

available information but also using erroneous calculation operations. This is shown in contingency judgments. The bounded capacity of the individual for the simultaneous management of sources of information limits the establishment of the correlation between events. The individual tends generally to establish relationships between events when objectively there is no relationship (tending to zero correlation).

Returning to our task of interest, the Act of purchase involves many processes. These not only take into account information about economic conditions but also psychological factors such as motivation, attitudes, perceptions and knowledge acquired (among others). For example, in some cases, the individual takes into account social stereotypes. It adopts consumption that responds to what we call "membership" principles in abstract social circles. In the second case, Lefcourt (1973), Langer (1975) found that it gets highlighted in what they call "illusion of control". The individual tends to establish a relationship between their answers and one external event greater than what is available. In other words, it is an overestimation or underestimation of the facts in their judgments given by this effect. These types of bias, given the use of rules or suboptimal strategies, limit the predictive capacity of the individual.

Other processes that the individual realizes in its reasoning are judgments of the probability of an event that are necessary to make value judgments. In this regard, the estimation of the individual capacity is limited in this regard. As mentioned above, individuals using a series of heuristics rather than basic statistical principles. In this regard, relevant research is offered by Kahneman and Tversky (1972, 1973) on "heuristics of representativeness and availability".

The first heuristic relates the use of the memory. The individual realizes estimates through the use of examples and associations that quickly come to mind in a given situation. That directly links to the ability of information processing. Processing more quickly or we could also think about it from where it is stored (here focuses on short-term memory), in this sense availability rule is functional to the available information. (And if as mentioned above, could we consider that the information processing is selective? Consequently would we be dragging biases?)

As for the second case, the heuristics of representativeness, the individual performs reasoning doing use of explanations or previous concepts rather than an analysis of accurate data. Emotional factors, time of recovery information, volume of information, can all affect the type of information that can be accessed quickly. Now, it should be considered that it also depends on the environment in which it is applied. If the environment is a little variant, the rule can be in effect, in other words, it is related to the normal distribution of events in continuous time.

Now consider the causal analysis of the reality, that which is more likely to explain an event in question. This type of analysis is called "causal processes". Analysts point out that it is not an automatic process, but rather depends on the capacity of the people. In this sense, since the literature is designated, that there are facts that contradict the optimistic vision that we have about this process. Reasons such as causal categories that respond to the individual's capacity or randomly do not take into account the type of event on which the process has been applied. Other factors would be the causal attribution errors. Such as the lack of motivation which responds to interpretable biases from cognitive and motivational budgets (personal preferences, habits of thoughts, etc.) leading to distorted perspectives at the information processing. However, the use of sub-optimal reasoning strategies does not necessarily result in errors or adopting behaviors or unwise choices. (But if we think about an act of consumption, how can we identify a misguided choice if it is about our preferences?)

According to the presented arguments, we try to show: first, that there is a sort of collective consensus underlying all economic and social decisions about how we assume that runs the world. Then certain behavior is expected. To a greater or lesser extent, our decisions are infringed by this assumption, limiting the processing of information. Second, the interpretation of the continuous flow of information is carried out within the framework of different analytical edges, using rules on which the individual believes that they can apply in that event. (What if their belief is wrong? aversion uncertainty?)

On the other hand, according to models revising the act of purchase's information processing is the second steps that conforms it. (Assael H. (1998), Nicosia (1966), Howard (1993), Howard and Sheth (1969), Engel, Kollat and Blackwell (1968), Bettman (1979), Schiffmann and Kanuk (1997), among other).

In the proposed model by Henry Assael (1998), the processing of information includes exposure of information, perception of information (interpretation) and memory (storage of previous events). Other models proposed by Sheth and Howard considered the brand as a fundamental factor in the process of decision of purchase for this step. The "Mark" effect on the purchase decision defines total comprehension of the consumer. In our opinion, this effect has a strong relationship with conservative attitudes of consumers.

At the model of Engel, Kollat & Blackwell, the second step is specifically characterized by the search of information. The consumer carries out an internal search on similar events experienced and if it is not enough, performs an external search. The timing of this search is conditioned by personal characteristics and the variable time.

Bettman (1979) presents a model of information processing (flow diagram) on the choice of the consumer, which proposes that there are 7 basic components: capacity of processing, motivation, attention and encoding, acquisition and evaluation of information, memory, decision and finally, consumption and learning. Basically, the individual is exposed to stimuli (input information), that capture their attention (this

process is selection relative to the search that the individual is doing and what it considers important); later in the stage of understanding, extract the meaning of the information that was considered relevant and retains the information to carry out further processing.

In the next stage of the processing, the consumer compares alternatives. Then compare the information obtained, stored in its short term memory, as evaluation criteria about the good (stored in permanent memory beliefs). These processes are relative to the processing capabilities of each individual, biases, its structure of preferences, and it is vulnerable to the immediate surroundings.

After the cited references, it can be induced that there are many psychological phenomena that in a conscious or unconscious way distorts the processing of information, therefore, make conditional on analysis of our immediate environment or the reality of the subjectively perceived.

Far from representing an exhaustive list, some factors that limit the processing of information are listed below:

1. Rules relating to the established moral order tracking induces the individual to operate with restrictions on the processing of information. The question is how does it influence their behavior? The follow-up of a moral order in some cases can lead to rational behavior. It has no place when decision-making is being adjusted to certain purposes that in determined contexts are not compatible. The processing of the information, in this case, is subject to a structure of thoughts relating to certain compliance purposes.

2. Processing of biased information that responds to patterns of social behavior.

3. We could relate the previous point with the so-called "Bandwagon effect". The bias of the information processing is given by beliefs or behaviors adopted because others already have it. It is the adoption of actions or thoughts of others because the social economic agent is vulnerable to the pre-existing factors. Another feature is to denote the adaptive dimension of the individual. Thus, the effects on decision-making of regularities in the behavior, although could be understood that they deal with complex calculations of cost-benefit and the individual's decisions, they are far from rational decisions.

4. Use of systems of values and beliefs, social norms;

5. Behavior is adverse to risk decisions, loss aversion, "effect minimum satisfaction".

6. Deformation of the actual information is expected to be a negative relationship between decisions e.g. in stress situation and quality of recovery of the stored information giving rise to increased cognitive bias.

7. Extrapolation of erroneous knowledge.

8. Interpolation process: through an abstract process the individual tends to believe that all known scenarios of the event and its repercussions can be interpolated to the new situation through analogies or induction. Facing uncertainty or imperfect information, the individual may be establishing a false causal relationship.

9. Learning through the transmission of knowledge and experience.

10. Learning: selection of information. The individual processes a finite amount of information.

11. Environment / context: the high variability of contexts becomes a less appropriate use of heuristics of representativeness, for example.

12. "Effect anchor" i.e., that the decision depends on a small part of the available information. For example, decisions of consumption between similar products (substitute goods) taking into account the price. This point will be further analyzed later in this paper.

13. "Attention bias". This bias responds to the trend that emotional stimuli in the own environment directs attention preferentially. We will return to this point in the following paragraph. If we assume that these stimuli are variable and depend on the environment, then it would affirm the fact that individuals do not have perfect preferences but relative and imperfect structure.

14. Biases of expectations: the relation between the establishments of a result that is expected possible and required to be fulfilled after performing a decision-making act. When the hope becomes a conflict, the information is discarded or underestimated. Two things could happen. First, this mathematical expectation can arise from miscalculations (envelope or underestimations of beliefs). Second, another case is the waiting of just one or a set of possible results when the factors involved may be giving rise to multiple results. It depends on the interpretive capacity and processing of the decision-maker.

15. Other cognitive biases

16. Perception of understanding

17. At the process of a purchasing decision, relating to the processing of information listed appropriately.

18. Uncertainty, risk

19. Information processing volume

In the next section, in accordance with the models that have been analyzed, we will design a flowchart that represents the processing of the information underlying the Act of purchase.

4. Purchase decision making

The processing capacity of the consumer information is analyzed from the perspective of "the Act of

purchase decision". Now, we need to focus on the reasoning that underlies the Act of purchase decision. The analysis part initially described the behavior of the consumer, the standpoint of the microeconomic theory applicable, and then the processing information that the agent engaged in.

If we look at consumer behavior from the perspective of utility maximization, we can find that several assumptions are far from being representative of the reality. The argument in favor is that until today it is a great influence in various disciplines, not by its explanatory ability, but rather by consensus implicitly accepting the characterization that acquires heuristic rules (scientific).

Assume perfect structural preferences. The assumptions of complete, reflexive, transitive, continuous and strictly monotonic preferences would allow us to ensure the existence of a continuous utility representative of such a preference function. These respond to assuming that the consumer is rational, with unlimited information and complete and perfect information processing capabilities. In many cases, assumptions such as transitivity or continuity of preferences, they are not satisfied. But it does not mean that we have an irrational individual but rather an individual with different rationales that respond to a VARIANT structure of preferences according to the context. On the other hand, we agree in assuming that consumers choose the basket of goods most favorable of the set of all affordable alternatives. In this sense, we are implicitly assuming that one's choice reflects a full knowledge and a perfect processing of obtained information. In this respect, we see the result, but not the process of how the individual arrived at an optimal choice. The cognitive processes involved is ex - ante choice. In general it comes with errors, intuitive heuristics, some degree of uncertainty and unpredictability, and motivations, among others, and in short, not knowing everything about selection strategies, organization, and processing of information. Thus, we might say it tends towards a precision in the reasoning of the consumer. While personal preferences are part of the motivational factors, the individual response to track their rules or heuristics could be incurring attribution errors. This type of distortion can be seen in socialized preferences of a motivational process that comes from shared beliefs. Preferences partially respond to the immediate environment and far from being the product of a process of efficient computation. So we might ask how the consumer forms preferences. Beyond the external factors that we know, we should consider the internal factors.

Secondly, we are talking about affordable alternatives, i.e., all those alternatives that satisfies the budgetary restriction of the consumer. As we know, it depends on the income available for consumption and a vector of prices. Here, we are assuming two things: that the individual makes use of all available information and reviews efficiently all the possible alternatives. On the other hand, it assumes that they do not influence the variables "time" (the time that the individual uses to process information) and 'space' (characterization of the immediate surroundings). However, we can immediately appreciate that their preferences may be conditioned not only by the perception of wealth that each makes about himself but also by "anchoring effect" that exerts the price in the information processing to perform the Act of consumption. It appears that the price has a double effect: on the one hand, as a restriction in terms of the amount of goods that we have and the other as bias in the processing of the information.

Then we have preferences that do not necessarily respond to efficient cognitive calculations but biases in information processing derived in partial use of all available information.

Now consider the choice of goods in terms of changes in prices and income. There are necessary and luxury goods, inferior and normal and Giffen goods. While this classification is ceteris paribus, to demonstrate the possible behaviors of the demand for goods, it is useful to highlight the following point. These assets, depending on the environment, are also likely to acquire a classification of the breach initially obtained before the faithful performance variations in these two parameters. In this regard, the choice between necessary and luxury goods is relative to variations in the level of income. Faced with rising incomes, individuals choose to consume more of both goods but a larger proportion of the two (higher proportion of luxury good). Now, according to the context, for different individuals, an increase in income may not necessarily result in equal changes in the demand for these goods. A much needed product is susceptible to acquiring the luxury good characterization of a luxury good but may not necessarily be a necessary product. If we look only in the first case, this susceptibility may be characteristic of the social and economic context in which we belong. An example of this would be to compare individuals that belong from different levels of wealth and belong to the lower tail of the distribution. In the case of normal and inferior goods and Giffen goods whose classification is based on changes in prices, we can find the same situation.

Now, let's look at the case of decision-making under uncertainty. The consumer makes decisions under uncertainty. It is assuming that the situation faced by the consumer is like a lottery, $p \circ x \oplus (1-p) \circ y$; a notation that means the individual receives information from the price x with probability p, y price y with a probability $(1-p)$. The Ellsberg Paradox and the Allais Paradox (1953) highlight how some axioms of expected utility theory are violated.

Continuing with the analysis, here we intend to highlight issues that are not explained by main microeconomic theory about the behavior of the consumer. Behaviors such as why is demand greater for expensive products? Why is the unexpected demand response for a product having the uncertainty of what is new?

The act of buying is a finite process that regularly feeds. It depends on the influence of the environment

(constraints), the importance of the decision-making of our peers, stereotypical consumption, technological advances, the stimulus to consumer behavior and the type of purchase. The decision process consists of several steps which are internal and external determinants. Broadly speaking, it begins when the individual consumer acknowledges, consciously or unconsciously, the existence of a subjective difference, perceived imbalance between the state of their situation and their environment. The consumer creates a necessity, with internal or external conditional (social, situational) factors. Quickly, the consumer reviews based on their beliefs and attitudes that influence their preferences in its profile experiences with similar features to the situation faced. Ex post decides to buy or not depending on whether it finds a satisfactory solution. In the second case, it continues searching externally. One phase of the buying decision process is the evaluation of alternatives. The consumer obtains information and compares with the current situation; he will choose the most convenient. The consumer "buys" if and only if it believes that it provides the same satisfaction as in the past or greater satisfaction.

The Act of purchase is not only conditioned 'why buy' but also how, where, when and to whom. The complexity of the decisions depends on required information and access to it. Also, depend on the risk associated with the consumption of that good, of the variable time, the price of the good and of the image of the buyer.

According to the models analyzed and with the aim of promoting understanding, a flowchart is presented to show the process of purchase of our consumer. This figure is the representation of abstract algorithms that represent the different stages of the Act of purchase. The objective is to show what stage the processing of information is and from there point out the intervening factors that influence at it.

Using these abstract algorithms and taking into account previous research we try to represent the entire purchasing process. The sequence represents a structure of implicit thoughts that occur.
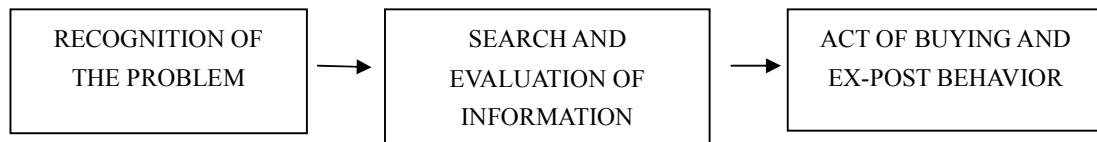
1°
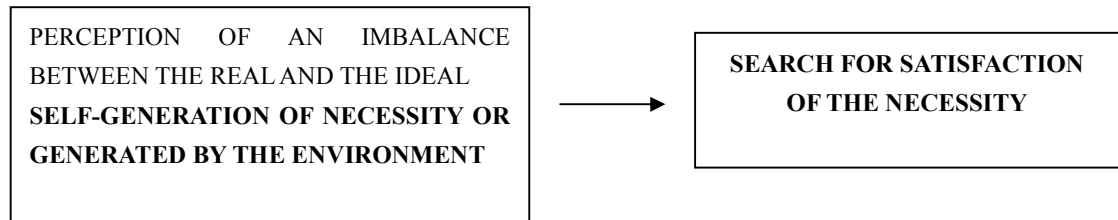
2°

Figure 1. Abstract algorithms 1° and 2° represent the process of the purchase decision

The individual perceives a material imbalance, an unsatisfied necessity. We will not discuss how this need is created because that is the result of a complex process and is not the purpose of this paper.

Then, recognizing the problem gives rise to the idea of "satisfying that necessity." In this regard, the information processing that underlies the decision of purchasing act is explained as follows: The individual begins with the step of finding and evaluating information. This process is internal, the agent checks the short-term memory and external, and assesses the constantly evolving context. The evaluation of information is being reduced and precise content evaluated. Stimuli, either own or agent, making condition in the search. For example, through advertising, its intent is to create an abstract image in the receiver, the consumer, so that later, the agent forms an attitude or behavior pattern of consumption for a given product segment. The idea is to capture consumer attention. "Bias attention" restricts the analysis of information, and is limited to stimulating environment. The individual will not notice stimuli that are considered irrelevant to their needs. Moreover, the issuer implicitly builds a structure that satisfies the objective to be achieved. Perception and understanding depend on their quality. It can be affected by the default since the data analysis was carried out initially on subjective alternatives. In this regard, it is likely to be subjective, selective, temporary and constantly changing. The consumer is not provided with a complete but partial capacity perception that responds to stimuli and the perception that it wants it. The process of perception is a short-term phenomenon and continuous evolution because it will evolve more events that include their experiences, needs,

motivations, and stimuli. It is reflected in an ongoing process of perceptual coding. Throughout all this internal process, the individual can go about building fallacies, arguments whose premises or conclusions may be erroneous. The perceptual bias can result from several factors; here, responding to attributional errors and motivational factors. Attributional errors may react to "anchor effect" on prices or brands. The anchoring effect is estimated on the basis of an information anticipatory scheme, before testing a particular estimate. In short, the gradual adjustment deliberate mental estimate from the anchor ceases when the individual sees no need to keep adjusting. Considering price, the individuals anchor their purchase decision on this entry, which ultimately determines the act.

Several factors can explain it. The individual faces its budgetary restraint and measures according to how many units of the good could be acquired according to its cost. On the other hand, assessing the cost of the opportunity to obtain another product of similar features but to satisfy the same need. Now, in this assessment the individual starts to analyze "prices" and "mark". Since this internal process under uncertainty is conducted, the individual exhibits a susceptibility to "brand" fallacy. This variable is its second anchor; it means that a higher price means a better quality of a product. This argument can be feasible in certain segments of the property market. But given the limited capacity of information processing and being a result of poor mental operations that respond to the "law of the least effort", the individual extrapolates it and it is translated into a belief. Then, the individual applies it constituted already as a fallacy; the product of the easier thought process which is used on a daily basis. It can be possible that the review of the information, given this belief, does not correct bias, and may be a social belief into one of the industrial cultures of the market.

In this regard, the quality of perception could limit the establishment of an abstract price - quality relationship. In this sense, such a relationship could be affected by the decoding of the received information from the environment, which is followed by an act in consequence. Processes of comprehension, classification and interpretation are far from being optimal and make efficient use of all available information. Perceptual bias, given by the selection of the information, is characteristic of each.

Returning to the "anchor brand" by Howard (1993), he talks about recognition of the brand, and on the importance of it for the consumer. In this sense, the consumer develops an attitude toward the brand and establishes the confidence to judge it. The attributes of the recognition are given by the color, size and packaging, so the design of the product and container are essential. The author understands to categorize a mark, which through its recognition is given; consumers only need to know about its function and form. But we could consider the social effects of the environment, social needs, and estimates of the individual's own needs, the factors that determine the attitude towards it, and the experience, among others. According to the pyramid of needs of Maslow, the individual in his search for the satisfaction of social needs (such as affiliation, acceptance and/or feelings of belonging) makes consumption in order to accredit fictitious social requirements. In this sense, that would determine the membership of the desired environment.

About the motivational factors, they also activate selectively using information supporting the Act of consumption that produce systematic errors influencing the beliefs that affect the structure of preferences that will be built according to what is perceived. All of this determines criteria for product selection rising in evaluations of alternatives affected by beliefs, attitudes formed against the product, and the predisposition to consumption. The individual in their internal process already houses the intentionality of purchase, which is a priori, the decision of an act of purchase. That, either by the initial need satisfaction or re fitness for the act of purchase decision when the influence of external factors such as marketing among other variables, e.g., is strong.

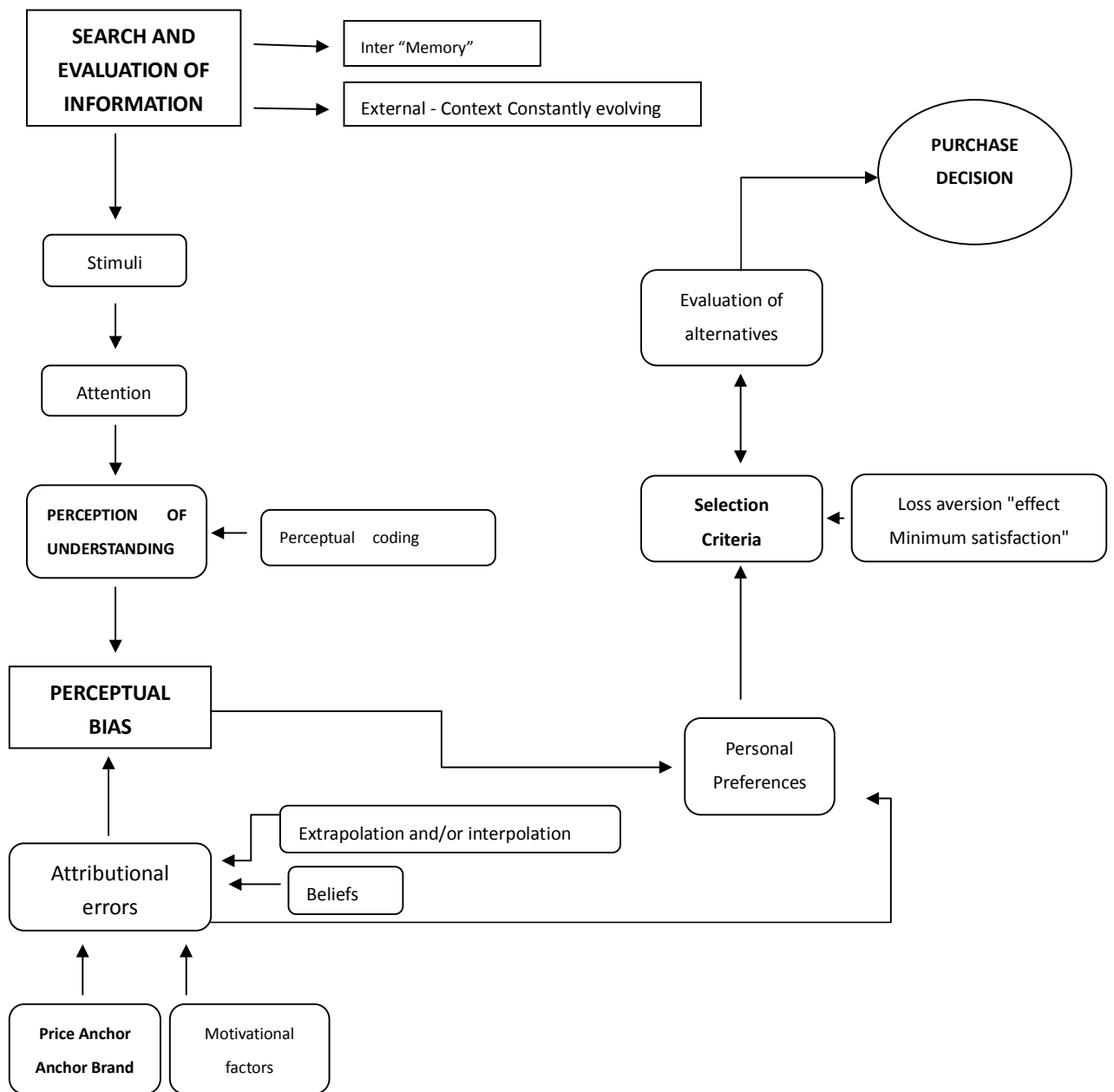We build the following flow diagram for explaining limited information processing:

Figure 2. Flow diagram of capacity limited information processing

Note that this scheme includes feedback and information that influences future procurement processes. By various factors, the experience limits the processing of the information, and this is susceptible to different processes of processing with systematic errors in varying degrees. Processes are far from being sophisticated, and are associative processes more than calculation decision making for a limited time.

5.   Model

According to the above, models are based on certain assumptions. As principal components, we have: a) the existence of the need; b) the generation of the need for the marketing organization; c) motivation that the consumer is in the immediate environment; d) internal information (memory) and external; e) structure of imperfect preferences and f) the implicit cognitive process.

Rubinstein (1998) presents the following theoretical statements to model the process of decision-making

with bounded rationality.

Assumptions are following:

1. Decision is under uncertainty,

2. Economic agent has a bounded rationality, deliberative agents

3. Processing of information relating to limitation of the information and on the cognitive ability of calculation.

4. The structure of preferences relating to the process of perception

a) The structure of imperfect preferences through a relationship of similarity that as a binary relation set is taken $I = (0,1)$ that satisfies the following properties:

b) Reflexivity $\forall a \in I, a \sim a$

c) Symmetry $\forall \, a, b \, \in I, if \, a \sim b, then \, b \sim a$

d) Continuity $\sim$ *The graph on the relation $\sim$ is closed in $I \times I$*

e) Betweenness *If $a \le b \le c \le d$ and $a \sim b$, then $b \sim c$*

f) Nondegeneracy $0 \nsim 1$ and

$\forall \, 0 \langle a \langle 1 \, \exists \, a, b \, so \, that \, b \langle a \langle c \, and \, a \sim b \, and \, a \sim c. \, \forall a = 1, \exists \, b \langle a \, so \, that \, a \sim b$

g) a^* and a_* The largest and the smallest element in the set are similar to a. Both are strictly increasing functions in a at any point at which they obtain a value different from 0 or 1.

A family of relationships that satisfies all of these requirements is the relation of similarity λ-ratio: a ∼ b if $1/\lambda \le$ a/b $\le$ λ con λ>1. In general terms, consider H a continuous function strictly increasing in I. The relation: ***a ∼ b* if $1/\lambda \le$ *H (a)* /*H (b)* $\le$ λ** It is a relationship of similarity. In this case we say that (*H*, λ) represent the relation ∼. To illustrate a possible process of decision to consider an agent that should choose simple lotteries of type (*x, p*) It means the prize $x with probability *p* and $0 with residual probability *1-p*. We will model a simple decision process taking how primitive two relations of similarity: ∼*x* y ∼*p*. Suppose, we want to choose between two lotteries $L_1 = (x_1, p_1), L_2 = (x_2, p_2)$ en $A = X \times P = [0,1] \times [0,1]$

Now, we assume the following:

Step 1 (check dominant strategy): if *Li give biggest prize most likely choose L*i

Step 2 (check similarities)

If $p_i \sim_p p_j$ and not $x_i \sim_x x_j$ and $x_i \rangle x_j$ so, choose *Li*

If $x_i \sim_x x_j$ and not $p_i \sim_p p_j$ and $p_i \rangle p_j$ so, choose *Li*

When step 2 is not decisive would have to propose any step 3 that is not specified. It is assumed that the relationship of preferences $\succcurlyeq$ *es* $\ast$ $\left(\sim_x, \sim_p \right)$ consistent if for any pair of lotteries L_i and L_j , if L_i It is elected in one of the first two steps of the procedure, then $L_i \rangle L_j$. Any of the three conditions imply that $L_i \rangle L_j$

ii)   Both $x_i \rangle x_j$ and $p_i \rangle p_j$

iii) $p_i \sim_p p_j$ and not $x_i \sim_x x_j$ and also $x_i \rangle x_j$

iv) $x_i \sim_x x_j$ and not $p_i \sim_p p_j$ and also $p_i \rangle p_j$

In Rubinstein (1998) the preferences on the set of alternatives are often derived from a particular structure of the information. It based their preferences on the whole A, on calculating the outcomes of A. The agent perceives a set of possible consequences, G. It has a relation on G.

（V：$G \rightarrow R$）. The agent perceives the causal dependence of consequence on alternatives, described by a function result $A \rightarrow G$, chooses from a set $A \subseteq A$, that believes is the best consequence (chosen alternative). Likewise, in the space of States Ω, whose elements represent exogenous factors that are relevant to the consumer. Then, the function result depends on Ω, $f : A \times \Omega \rightarrow G$. Each action $a \in A$ corresponds to an "Act" (a function that specifies an element in C for each State in Ω) $a \, (\omega) = f(a, \omega)$.

Given the effect anchor in "prices" and "mark," often when considering purchasing a product, the first thought sequence develop is in relation to the price. Sometimes quality of product is being looked for, but

there is uncertainty. In some cases, we does not decide based on the cheapest since we assume that it possibly contains fewer processes and the quality is not so good. Here it is not being said that the most expensive is chosen, which is different. Even so, we can continue questioning ourselves about future election and loss aversion, often falling into the fallacy "mark". This may be caused by two events: i) either have no knowledge about the true value of the product (not referred to the price), therefore inferring its market price, translated in terms of cost, is difficult to estimate or ii) given that, on average regardless of the type of goods, in the search for quality goods, we establish abstract correlations between the price (high) quality (highest) or the quality and brand. Although this assumption culturally is accepted and established as a collective belief, nothing tells us that this relationship necessarily will be fulfilled in all segments of goods.

The epistemology of the brand is related to something more than this beyond the satisfaction of consumers and indirectly related to the quality of the product since it assumes the role of an incentive for attracting good demand.

For the model that then we will develop, it shall be required of this representative consumer that we've already endowed with certain characteristics of the decision of the consumption behavior.

Here, following the model of Rubinstein (1998), we present the model with cognitive bias. Since the structure of information strongly influences the characteristic of its decision, the variant introduced here is a new information structure that includes not only price but also quality and brand effects.

The model focuses not on empowering the decision taker to make an optimal decision. There are restrictions on the information perceived or information that can be transferred from the moment in which one has access to price information in one of the shops at the time that he has to make the decision.

Assumptions:

- Set of action A
- Set of states Ω, *all the sets of possible prices that can be offered in store i.*
- Probability measure π on Ω.
- Utility function u defined Ω
- P function of information
- $P(\varpi)$ the decision making of the function of information P in the State ϖ
- S It is the whole of the structure of the information. It will reflect restrictions on the structure of the original information about the set of partitions that decision taker can be used. Agent chooses a structure of the information subject to the restrictions that express their ability in the processing of information and response to the environment in which it is operating.

  In this case, we assume that the belief "Brand" (higher-priced, higher-quality) integrates its with information structure. The individual looking for quality of the product but does not have information about the product and prices, through associative processes and extrapolation of knowledge, the individual uses this belief.

- Belief: high ratio between price and quality. Brand $M_i \ i = (1,2) / 1 = known \ and \ 2 = not \ known$.
- Quality $q_i, b_i \quad i = 1(high \ quality), 2(median \ quality), 3(low \ quality)$

  $\therefore \ M(q_i) \ and \ M(b_i)$

- Risk Aversion $0 \langle \sigma \langle 1$. We assume that you have aversion to loss (Kahneman & Tversky, 1984). We assume the risk aversion increases in the short term. For that we can assume that much more short term, the buying most adverse to risk is shown and, if we take into account the decision in an instant of time, is supposed to be equal to 1. The loss aversion, "satisfaction minimal effect" means that the psychological benefit that leads one to not buy the cheapest product, is less than leading one to choose the cheapest product psychological cost. This subjectivity of perception is expressed in monetary terms is the price of the product that is selected.

- Incomplete information. The agent does not have complete information on existing prices.

Given (ω, M), the agent chooses $a (P, \omega, M)$ that maximizes expected utility given the conditional probability π for event $P (\omega, M)$. The value of the information P partition is $Ex[u(a(P,\omega),\omega,M)]$. The problem is to maximize $p_{\in S} Ex[u(a(P,\omega),\omega,M)]$

The approach includes "quality", "high prices" "low prices", "brand". The individual has strong preferences for quality. We assume that the search for quality is zero cost, retailers are coming and that it is indifferent to buy in one or another market. It is assumed that the price differential between a good does not have a significant effect on their budget constraint. The difference between one price and the other is low. Then we have an agent that you want to buy an asset in one of the two shops at the prices ω_1, ω_2 independently distributed π_1, π_2. The consumer used a structure of information $(\Omega_1, P_1, \Omega_2, P_2, M)$. We assume positive correlation $\rho = 0.9$ between price and quality.

Steps: 1) the individual observes the first price $\omega_1 \in \Omega_1$ and $M_i i = 1,2$

2) Classifies information in $P_1(\omega_1)$ and M_1. In the process of selection of information it takes information from the environment and extrapolates.

3) See the second price $\omega_2 \in \Omega_2$ and M_2; then immediately constructs an informative outline of anticipated prices and quality $\omega_1 \sim \omega_1 \rightarrow high\ price$, $\omega_2 \sim \omega_2 \rightarrow low\ price$ and selection criteria. It evaluates conditional to belief, bias anchorage, money, brand, personal preference and aversion to risk $\sigma = 1$.

4) The decision on the basis of their memories and its heuristic construction approaches price-quality. Decide to purchase good 1 $P_1(\omega_1, M(q_i))$, if and only if, the expected shop 2, price ω_2, is lower than the expected price in shop ω_1. In other words, the relation price - quality reveals strictly preferred to the low price - quality relationship, $\omega_{1M_1} \succ \omega_{2M_2}$. In the end, the decision that satisfies the individual decision is $P_1(w_1, M(q_i)) \ \forall i = 1,2,3$.

The interpretation that the model wields can come given through restrictions in its structure of information regarding the effect of the anchor in price, quality, and brand. The actor faces restrictions on the ability of processing. He sees prices and tries to build a categorical scheme between "high" and "low". At the same time, as it has strong preferences for the quality of the product which does not have knowledge, by beliefs, tends to infer the quality. He extrapolates knowledge extracted from other experiences, checks marks and consequences of the environment, and given that knowledge can be transferred, the agent adopts the belief of the environment, and categorizes brands. This pathway settles selection criteria, analyzes prices and finally decides buy that product whose price is not the lowest. The model is shown in the figure below.
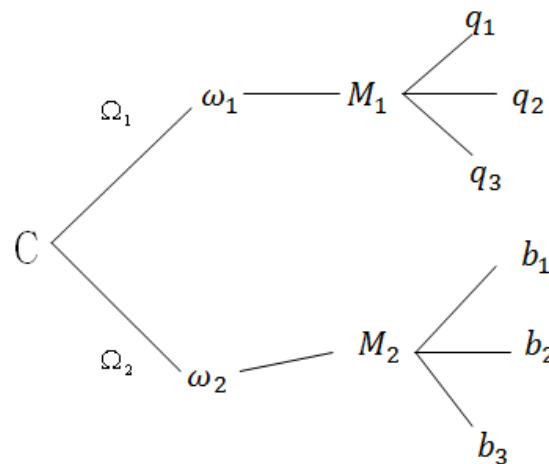

Figure 3. Model of consumer's behavior: Anchoring Effect in prices and mark.

6. Conclusion

This paper shows that the individuals tend to achieve an optimum which is conditional on their restrictions and complies with its assumptions of minimal satisfaction. They chose a relative optima. Their optima are strongly conditioned by their immediate surroundings and their beliefs. This responds to the subjective perception of each, their beliefs, and imperfections in the processing of information, shortcomings, or inability to learn. In this regard, we also should consider the effects of information *vis-à-vis* processing capacity. First, we have to define the variable 'information' stock or flow. Depending on its treatment and for explanatory purposes, it is likely to acquire both categories. The information is an exponentially increased variable whose returns after a certain limit are decreasing. The processing capacity has reached a point of diminishing returns, and becomes limited. The increase in information, after a particular point, increases the likelihood of risk to make mistakes, further deepening the existence of cognitive biases.

It is essential to understand that each individual is the holder of a guide to mental constructions. Thus, we go to readapting in time through experiences or knowledge acquired or accepted from the environment, which are far from exact and logical constructions of the processing.

Deepening the knowledge on the processing of information, use of heuristics, the persistence of cognitive biases and advances in the modeling of these approaches, would allow a better understanding and

representation of decision making in the Act of consumption. It starts from the assumption that behind every decision-making process, there is a pursuance of consensus that is implicit in economic social interaction between individuals, rather than the optimization of it, this, and could be a first step.

There could be additional reasons than the one we employed here. So, further research is also needed to identify those factors. Future research could be conducted to link this study to neoclassical effects concerned with rising demand curves. Thus, a nonfunctional demand for a consumer´s good which is due to external effect on utility as snob, bandwagon and Veblen effects enter into the analysis.

A major suggestion of this analysis is that the demand could rise with rising prices. Further research could also be conducted regarding deals with a budget constraint, ruling in an income and substitution effect, when the price goes up.

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