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Environmentally Sustainable Innovation: Attributes Expected in the Purchase of Green Vehicles and Furniture

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Abstract

This article investigates the perception of potential consumers regarding the offer of environmentally sustainable products. Employing projective techniques for sentence completion, it sought to discover which attributes of green products and processes are expected by automobile and furniture consumers, along with the risks associated to the offer of said characteristics. Considering the completions made, it was possible to observe that the 12 respondents are aware of the product and process attributes that the studied industries provide in terms of environmentally sustainable innovations. Nevertheless, it is inferred that green innovations in automobiles may generate a perception of functional risk among consumers, that is, that the product does not offer the desired performance. By the other hand, the completions revealed that the respondents perceive lower social and financial risk in green automobiles and furniture. The results obtained allow companies of the analyzed sectors to steer their innovation and communication efforts towards the attributes listed as qualifiers, while also assisting the theoretical investigation about the decision-making process for purchasing green products.

Keywords: *Consumer Behavior, Environmentally sustainable Products, Choice Attributes.*

1. Introduction

Rethinking current consumption patterns has become an urgent necessity for governments, trade classes, the press and companies (Koller et al., 2001). In fact, as suggested by Baudrillard (1995), the fundamental problem of modern-day capitalism does not lie in the contradiction of profit maximization and production rationalization, but rather limited productivity in the face of having to sell products. Lipovetsky (2004) completes the idea saying that the programmed obsolescence of products is a characteristic of modern markets, in such a way that organizations that do not regularly provide innovations lose penetrative force and weaken their reputation for quality. This results from the fact that buyer markets understand that the 'new' is always better than the 'old'.

Considering this scenario, we observe that the main action is not the quest for a reduction in consumption, but rather the development and promotion of green products (Lafferty et al., 2004; Trust, Chen, 2010; Croning et al., 2011). These products, also called ecologically correct or environmentally sustainable, are those able to add long-term benefits, reduce customer stress and alleviate their environmental responsibility without diminishing the so-called attractive qualities (Maxwell; van der Vorst, 2003; Cambra-Fierro et al., 2008; Triebswetter; Wackerbauer, 2008).

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Within this context, various studies that discuss ethical consumerism have been developed. Bhate and Lawler (1997), Diamantopoulos et al. (2003), Houe and Grabout (2009) and Yalabik and Fairchild (2011) mapped demographic, psychographic and situational variables that interfere in the acceptance of environmentally sustainable innovation by individuals. By the other hand, Mostafa (2007), Pepper et al. (2009) and Averdung and Wagenfuehrer (2011) investigated the origins of the favorable attitude concerning green innovations. The study by Welsch and Kühling (2009) shows that the consumption pattern of reference group members influenced the decision of buyers in relation to the acquisition of products with less impact on the environment. Lee et al. (2006) and Godstein et al. (2008) observed that the availability of knowledge and the flow of information about the environment, such as news about the quality of air and global warming, help articulate the demand for products that are environmentally sustainable. Other developments include studies that highlight price and quality as attributes that steer environmentally sustainable product consumption, which are also determining factors in the choice of traditional products (Brécard et al. 2009; Brouhle; Khanna, 2012).

Despite the abovementioned findings, a survey by Cronin et al. (2011) indicates a need for greater attention among researchers for the investigations of certain themes. Among them, these authors highlight: (i) habits and behaviors of subjects that influence the process of buying environmentally sustainable products; and (ii) the effect of consumer perception regarding green marketing strategies. As such, these authors recommend studies to identify the attributes that leverage the purchase of green products, to analyze the type of information and the content of the message pertinent to the promotion of environmentally sustainable innovations, and to seek to understand the barriers that jeopardize the decision-making process for buying green products.

Using the gaps described as a reference, and considering that the success of environmentally sustainable innovation results from, among other variables, the availability of information about the requisites that guide decisions related to buying green products (Brécard et al., 2009; Brouhle; Khanna, 2012; and Lin et al., 2013), this article investigates the perception that potential consumers have concerning the offer of environmentally sustainable products. Specifically, by employing projective techniques for sentence completion, it seeks to discover which attributes of green products and processes are expected for automobiles and furniture, along with the risks associated to the offer of said characteristics.

These sectors were chosen for investigation because they typically involve high and average participation in the buying decision process, based on: (i) comprehensive search for information and (ii) detailed assessment of alternatives (Blackwell et al., 2011). Furthermore, using the Industrial Production Indicators for Brazilian Industry Sectors and Activities as a reference, with a focus on the south of Brazil, these sectors presented the highest growth rate in the past eight years (IBGE, 2014).

2. Theoretical Grounding

2.1 Buying Decision Process

The study of consumer behavior encompasses the analysis of processes involved when individuals or groups select, buy, use or take advantage of specific offer to satisfy a need (Solomon, 2011). The area of investigation thus encompasses: (i) the stages experienced for making the decision, (ii) the specific types of purchases and (iii) environmental factors of influence. Regarding the act of deciding, there are many models proposed by researchers from the area. Considering that there are significant similarities among them, this paper opts for the model presented by Blackwell et al. (2011), described in table 1.

Table 1 - Description of buying decision process stages

| Stages of the deciding | Description |
|------------------------|-------------|
|------------------------|-------------|

| process | |
|---|--|
| Recognition of necessity | Occurs when an individual perceives an important difference between the current state and a desired state. Necessity may be generated through internal or external stimuli. |
| Search for information. | Occurs internally and externally. The internal is related to memories, whether through experience acquired through previous purchases or through other stored information. The external refers to the data collection process involving different reference groups and the promotion tool used by organizations. |
| Assessment of pre-purchase alternatives | At this stage the important attributes are analyzed. Research shows that the weight given to the different attributes may vary, along with the number of alternatives to be assessed. Some choices may occur between two options, while others involve a higher number of possibilities. |
| Buying | The act of buying involves what and where to buy. After the assessment of the pre-purchase alternatives, buyers' intentions can fall into one of three categories: fully planned purchase (products and brands are selected in the early stage); partially planned purchase (when the brand decision occurs at the point of sale) and unplanned purchase. |
| Consumption | Consumption refers to the process of using the acquired product, which may only involve the buyer or other users, too. During consumption, buyers check if the performance attributes that steered decision correspond to the "desired product" of the chosen offer, or not. |
| Assessment of post-consumption alternatives | The buying and consumption experience may generate satisfaction or dissatisfaction as a consequence. Thus, at this stage, consumers exercise judgment that may assume one of three forms: positive disconfirmation (performance better than expected); simple confirmation (performance equal to expected) and negative disconfirmation (performance worse than expected). |
| Disposal | Corresponds to the end of the product service life in the consumer's opinion. There is direct disposal, recycling and remarketing. Note that remarketing corresponds to the sale of used items, such as automobiles and real estate, among others. |

Regarding the specific types of purchases, studies on consumer behavior show that the degree of individual involvement is not the same in all decision making situations, which sustains the classification of acquisition experiences in specific ways (Gabriel, 2003). Furthermore, the fact that the purchase is initial or repeated also has a direct influence on the methodology of the deciding process that buyers will undergo (Schiffman, Kanuk, 2009).

Initial purchases may be complex (also called solutions to extensive problems) or can involve the solution of restricted problems or medium-reach problems. Repeated purchases, on the other hand, present the possibility of solving repeated problems or making habitual decisions (Blackwell et al., 2011). In initial purchases characterized as complex, it is likely that all the stages of the deciding process are engaged, seeing as though the impact on consumers regarding the responsibility of having made the wrong choice is more intense. In purchases of medium to low involvement, the effort spent by buyers over the deciding process is less, especially with regards to the rules for the assessment of alternatives (Bettman et al., 1998; Mowen, Minor, 2006).

Lastly, the environmental factors of influence show that the deciding process suffers direct interference from outside issues known to the consumer. Culture, ethnicity, social class, personal characteristics, family and situational aspects (related to the issues of promotion and the point of sale) are variables to be investigated as having an influence throughout the stages engaged during the buying decision (Blackwell, et al., 2011; Solomon, 2011).

2.2 Attributes of Choice and Perceived Risk

Buying decision processes result in the definition of the offer that best meets consumer needs. As such, during the assessment of pre-purchase alternatives, individuals use criteria to give dimension to which product, among those being considered, will be chosen (Blackwell et al., 2011). This means

that consumers perceive the offers as packages of attributes to be used in assessing the choice options, while not all possess the same importance. In this sense, distinct typologies can be employed to classify the attributes and their hierarchization (see table 2).

Table 2 - Typologies employed to Classify Attributes

| Author | Classification | Description |
|-----------------------------|--------------------------------------|--|
| Alpert (1971) | Notable, important and determinants | <i>Notable</i> - total set of attributes perceived in a specific product or brand, but which do not necessarily have the elevated importance or determination in the product purchase process. <i>Important</i> - a subgroup of notable attributes considered qualifiers, that is, those that must be present in order for the brand to be considered an option. <i>Determinants</i> - attributes situated among the important factors that are able to decisively influence the purchase. |
| Zeithaml (1988) | Intrinsic and Extrinsic Elements | <i>Intrinsic</i> - physical components and functional characteristics (design, durability, size, etc.) <i>Extrinsic</i> - characteristics associated to the product that are not part of their physical composition (price, brand, etc.) |
| McMillan and McGrath (1996) | Basic, Discriminators and Energizers | <i>Basic</i> - attributes that consumer assume to find in all offers in the market. <i>Discriminators</i> - unique characteristics that distinguish one product from its competitors. <i>Energizers</i> - attributes that steer the choice towards a specific brand. |
| Nowlis and Simonson (1997) | Comparable and Enriched | <i>Comparable</i> - attributes that consumers can compare with greater ease and accuracy, such as price and design. <i>Enriched</i> - attributes that are difficult to compare, such as brand and added services. |
| Peter and Olson (1999) | Concrete and Abstract | <i>Concrete</i> - physical and tangible characteristics of a product. <i>Abstract</i> - intangible characteristics of a product (such as perceived quality, for example). |
| Allen, Ng and Wilson (2002) | Instrumental and Expressive | <i>Instrumental</i> - intrinsic qualities of the object, function and utility, with rational judgment. <i>Expressive</i> - use of the object as a mechanism of self expression, with an emotional judgment. |

Besides discovering the attributes valued by consumers, organization managers must comprehend the rules of weighing options in the definition of the purchase. Conceptually, the deciding rules correspond to the strategies that select one among many choice alternatives (Bettman et al., 1998). As a result of the type of purchase that the buyer is making, they may vary from simple procedures to others that are significantly elaborate (Gabriel, 2003). This occurs due to the perceived risk. Conceptually, we may say that perceived risk encompasses two main issues: uncertainty and consequences. According to Schiffman and Kanuk (2009), despite not enjoying academic consensus, in general six different types of perceived risks are discussed in literature: (i) financial; (ii) physical; (iii) social; (iv) performance; (v) psychological; and (vi) risk of time/convenience.

3. Method

This is an exploratory study, which is considered a suitable method in attempting to obtain the insight to develop an approach to the problem, namely, identifying the attributes of the green product and process are expected for automobiles and furniture, as well as the risks associated to the offer of such characteristics. Regarding the approach used, both research of secondary data and field research were conducted.

Through the investigation of secondary data it was possible to identify the environmentally sustainable attributes that the automobile and furniture industries can offer. According to Malhotra (2006) secondary data are those available in commercial organizations, collected for a purpose that differs to the problem in question. They constitute sources for non-governmental organization research, like periodicals specialized in the fields of study (such as the automobile magazines) and trade associations (as Anfavea and Abimovel).

In field research the collection of data follows a qualitative approach, using projective techniques. Projective techniques constitute a non-structured and indirect form of questionnaire able to encourage interviewees to project their motivations, beliefs, attitudes or feelings towards the problem under study. Among the possible collection techniques for projective methods, the study used that which involved the completion of a story that is based on information from secondary data research, as well as theoretical references on the cognitive model of the buying decision process by Blackwell et al. (2011), placing emphasis on the pre-purchase alternative assessment stage. Thus, because these techniques include asking respondents to complete a stimulus situation, during the data collection procedure, stories were handed out that were related to the buying decision process for cars and furniture so that the respondents could formulate conclusions in their own words. The validation of the content was undertaken by two specialists.

Data collection involved 12 respondents, selected through a decision based on criteria such as age (intervals of 21-30, 31-40, 41-50), social class (A and B) and education (higher education). The choice of these variables is justified by the fact that personal factors have a major influence on the buying decision process (Solomon, 2011). Regarding the number of participants, we note that in qualitative studies the importance of sample elements is centered on the comprehension that they will provide regarding perceptions, preferences and the behavior of consumers, and not in the quantity of sample elements.

Regarding the procedure for data analysis, content analysis was employed. As such, firstly, each significant fraction of the text material was separated, isolated and then coded. After codification, categorization was conducted using the deductive method, that is, categories were established based on the theoretical content and secondary data from research on the subject.

4. Result Analysis

4.1 Analysis of Secondary Data Research

To discover the attributes of environmentally sustainable products and processes that the automobile and furniture sector provide in buyer markets, specific periodicals were studied, along with investigations in trade classes in both industries. Thus, table 3 presents a list of attributes related to the practice of innovation in the investigated industries.

Table 3 - Environmentally sustainable attributes of the researched industries

| Attributes | Automobile Industry | Furniture Industry |
|-----------------------|---|---|
| Product Attributes | High mileage per liter of fuel; Equipment and components for the reduction of pollutant emissions; Electric engine; Hybrid engine; Recycled materials present in the vehicle; Organic materials present in the vehicle. | Certification seal for raw materials used; Easy maintenance; Durability; Facility in assembling and disassembling; Recycled materials present in the furniture; Organic materials present in the furniture; Furniture fully produced from recycled material. |
| Production Attributes | Reduction in the volume of heavy materials used in the assembly line; Reduced consumption of electric energy during assembly; Generation of electricity in assembly; Waste treatment Projected maintenance and repairs; Materials from the car to be recycled at the end of its service life; Action projected for the final disposal of the product. | Reduced consumption of electric energy during manufacture; Use of certified wood; Use of reconstituted sheets of wood; Waste treatment; Development of byproducts from the waste from productive processes; Research for the development of furniture using the waste from other products (wood, plastic, etc.) Action projected for the final disposal of the product. |

Knowing the attributes allowed the data collection instrument to be qualified, that is, along with the buying decision process reference model proposed by Blackwell, et al. (2011), they subsidize the preparation of stories to be completed by individuals. Furthermore, having clarity on the product

attributes already available in the consumer market, as well as the process attributes that can minimize the environmental impact of products, we can investigate the sample elements' knowledge of them.

4.2 Field research Analysis

In line with the criteria described in item 3, the sample was comprised of people of both genders (six men and six women), aged between 21 and 50 years old, with all respondents possessing a higher education. Regarding the identification and analysis of green attributes relative to the purchase of cars and furniture, using the completed stories as a reference, first the results obtained for the automobile industry will be presented, followed by those from the furniture industry. It is worth noting that the requested completions were aimed at first generating general green attributes for products and production. Later, an effort was made to investigate the green attributes of the product's properties and, lastly, green attributes related to the performance of the product. This systemization is apparent in the study of secondary sources on the subject.

Regarding the green attributes valued by those interviewed when evaluating automobiles, there was a noted regularity in citing the economy of fuel per kilometer driven, the use of recycled materials, use of flex-fuel technology, possibility of using biofuels, characteristics that reduce the emission of CO₂ and also hybrid engine technology. With respect to the general attributes related to the productive process, the majority highlighted new technology research as a key attribute. Another attributes cited were "the use of recycled materials" and "the use of organic materials".

For product characteristic attributes, most individuals highlighted the use of recycled materials. In addition, "flex-fuel engine", "use of natural fibers", "hybrid engine", "electric engine", "engine that operates with biofuel" and "use of lighter materials", were also mentioned. In this item, analyzing the completions, it was possible to identify consumers' concern with regards to performance and comfort of vehicles, thus they feel that the attributes mentioned should not have a negative impact on the other attributes. As such, we note that the respondents tend to experience functionality risks when exposed to specific attributes of green vehicles.

This interference is apparent when analyzing the projected performance attributes for green cars, as the "less power" attribute was associated to an environmentally sustainable vehicle by all the responders. Still on the subject of green vehicle performance, the "lower cost" attribute was cited as a result of the fuel savings per km driven. Table 4 shows a summary of the attributes mapped as relevant for the purchase of green vehicles considering the completions provided. Note that we did not identify relevant differences considering the categories (gender, age) used to define the sample.

Table 4 - Attributes Mapped for Green Vehicles

| Attributes | Regularity |
|-------------------------------------|------------|
| Economy (mileage per liter of fuel) | 10 |
| Use of recycled materials | 9 |
| Flex-fuel car | 9 |
| New technology research | 6 |
| Engine that operates with biofuel | 6 |
| Lower CO ₂ emissions | 4 |
| Hybrid engine | 4 |
| Electric engine | 3 |
| Use of natural fibers | 3 |
| Reduction of waste | 2 |
| Correct destination of waste | 1 |
| Lighter metals | 1 |

About the green attribute valued by the respondents when evaluating furniture, the use of recycled materials is the most frequently cited, followed by raw materials from reforestation, easy maintenance and certificate of origin. With regards to general attributes related to the productive process, greener production technology was the attribute most often mentioned. Next, "total reuse of cutting waste", raw material from reforestation, "waste treatment" and "use of natural fibers" were cited.

About the product characteristic attributes, the majority of respondents feel that green furniture must combine organic and recycled materials. Regarding organic furniture, the people highlighted the use of wicker and fibers, as well as demolition furniture. Additionally, in the lower age bracket groups, reverse logistics was cited, since they hope that the companies that sell furniture should be also prepared to receive these items when consumers no longer want them.

For the green furniture performance attributes, the sampled consumers highlighted durability, easy maintenance, easy assembly and disassembly and design (attractive and comfortable furniture). Based on the evidence, table 5 sums up the attributes mapped as relevant for the purchase of green furniture by the respondents.

Table 5 - Attributes Mapped for Green Furniture

| Attributes | Regularity |
|---------------------------------|------------|
| Use of recycled materials | 10 |
| Raw material from reforestation | 9 |
| Easy maintenance | 8 |
| Certification of origin | 8 |
| Greener production technology | 7 |
| Recycled furniture | 7 |
| Use of natural fibers | 7 |
| Total reuse of cutting waste | 4 |
| Use of demolition wood | 4 |
| Design | 3 |
| Waste treatment | 2 |
| Reverse logistics | 2 |
| Easy assembly and disassembly | 2 |

As in the assessment of pre-purchase alternatives, consumers use criteria to access which product, among those being considered, will be chosen (Blackwell et al., 2011), a sum was used to highlight the main attributes/requisites perceived as important/qualifiers in an environmentally sustainable vehicle and furniture. Table 6 shows these important attributes, as well as the variables associated to them, which may positively influence the buying decision (Alpert, 1971).

Table 6 - Attributes and variables for green automobiles and furniture

| Important attributes/qualified for automobiles | Regularity of citation | Associated variables |
|--|------------------------|--|
| Vehicle engine | 17 | Flex-fuel car Hybrid engine |
| New Technologies | 16 | Engine that operates with biofuel Lower CO2 emissions |
| Materials used | 13 | Recycled materials Use of natural fibers |
| Important attributes/qualified for furniture | Regularity of citation | Associated variables |
| Origin of raw material | 27 | Natural fibers Demolition wood Reforestation wood Recycled material |
| Certification | 21 | Certification seal |
| Production technology | 21 | Total reuse of cutting waste Waste treatment Easy maintenance |

Lastly, considering the completions provided by the respondents, it was possible to note that they are aware of the product and process attributes that the studied industries provide in terms of environmentally sustainable innovations. Nevertheless, it is inferred that green innovations in automobiles may generate a perception of functional risk among consumers, which tends to cause fear that the product does not offer the desired performance. By the other hand, analyzing the completions

we note that the respondents perceive less social and financial risk in green automobiles and furniture, that is, green products will not result in social embarrassment and are worth the associated cost (Schiffman, Kanuk, 2009).

5. Final Considerations

This study sought to discover the product and process attributes perceived for green vehicles and furniture, along with the risk associated to them. In short, the results obtained allow managers of these sectors to steer their innovation and communication efforts towards the attributes listed as qualifiers, while also assisting the theoretical investigation about the decision-making process for purchasing green products.

However some limitations, resulting from the qualitative approach, must be mentioned. Initially, it was not possible to generate the determining attributes for the purchase of green automobiles and furniture, as these result from consumers' judgment on utility (Alpert, 1971). Thus, we suggest a quantitative study that, using conjoint analysis or similar techniques, determines the relative value that individuals place on the relevant attributes, as well as the utility they associate to the variables of these attributes.

Furthermore, being qualitative, this study proposes relationships that call for additional analysis, such as the perceived risks and the risks minimized by green attributes. These steps for verification can be developed through experiments and could involve not only the industries investigated in this study, but others, too, that place their offers in buying processes of less involvement. Experimental projects could determine to what degree some green requisites minimize perceived risk in specific deciding processes, as well as the degree to which some risks may be harmful to the intention of buying green products.

Armed with this information, industry could improve the management of the methods and techniques employed in the product development process, such as Quality Function Development, Design for Manufacturing, Fault Tree Analysis, Failure Mode and Effect Analysis, and Value Engineering & Value Analysis. Theoretically, the development of suggested qualitative studies would contribute by reducing the gap described in the review by Cronin et al. (2011), while also allowing for the development of deeper studies, both for the identification of alternate courses of action and to develop hypothesis, since values, motivations and attitudes demand more flexible investigation alternatives and are latent issues in the ethical consumption area (Pepper et al., 2009; Averdung, Wagenfuehrer, 2011).

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