

Affective and Pleasurable Values that Ergonomics Provides to the Product Design Inspired and Produced from Natural Amazon Resources

Susana Paixão-Barradas, Karla Mazarelo and Mirella de Sousa

Abstract For centuries, people have created and refined products. Nowadays the consumers are looking for emotional benefits rather than utilitarian performance. The challenge today is to switch from material product dimensions to a holistic view of consumer experience. The design products inspired by natural elements and produced by raw natural materials may contribute to this satisfaction. Through ergonomic inputs about the human factors on multisensory perception of a product, we conducted a study to identify the affective and pleasure values, and to estimate their pertinence, in a product conception inspired and produced with natural Amazon resources. A quantitative technique, based on a questionnaire during a product exhibition, was employed. People appreciate the use of natural raw materials in the creation of new products, preferring mainly to natural product finishes preferring mainly to natural product finishes, its unique character, the textures and the historical and cultural values. The implications and limitations of the approach are discussed and further research steps indicated.

Keywords Product design · Natural resources · Effective and pleasurable values

1 Introduction

For centuries, people have created and refined products. A common understanding of Gestalt laws or color harmonies has developed within and beyond cultural borders. Designers have long been occupied with form-giving of material products,

S. Paixão-Barradas (✉)

Department of Strategy, Sustainable Development and Entrepreneurship,
Kedge Design School, Toulon, Provence-Alpes-Côte d'Azur, France
e-mail: susana.paixao-barradas@kedgabs.com

K. Mazarelo · M. de Sousa

Laboratório de Produção Gráfica (LABGRAFIC), Departamento
de Design E Expressão Gráfica (DEG), Faculdade de Tecnologia (FT),
Universidade Federal do Amazonas (UFAM), Manaus, Amazonas, Brazil

asked to work on form, color and semantic; while engineers dealt with functions, components and performance [1]; and the ergonomists were occupied with the comfort, the safety and the adaptability of the product. Nowadays the consumption experience as a phenomenon is directed to-ward the pursuit of fantasies, feelings and fun [2]; consumers are looking for emotional benefits rather than utilitarian performance [3]. The challenge for products developers is to switch their focus from material product dimensions to a holistic view of consumer experience [4].

We believe that the design products inspired by natural elements and produced by raw natural materials as an Amazonia may contribute to this satisfaction. Through ergonomic inputs about the human factors on multisensory perception of a product, we conducted a study to identify the affective and pleasure values, and to estimate their pertinence, in a product conception inspired and produced with natural Amazon resources.

Through a brief introduction about the importance of the design values that come from the raw natural resources in use for create empathy, affectivity and pleasure; this article proposes, through a questionnaire about the exhibition of 13 products inspired and produced in Amazonas, answer to these two questions:

- *What are the design values that people most appreciate in our products?*
- *What are the values of the design most appreciated by the people who highlighted ergonomics in our products?*

2 The Context

Design research literature refers to pleasure as a product benefit that exceeds just proper functioning; pleasure is an emotional benefit that supplements product functionality [5]. All human interactions involve emotions, including interaction with our material world; and for the designers it is important to design products that ‘fit’ the emotions of the users [6].

The perception involves two closely related mechanisms: cognition and affect. Cognition enables the human to understand his environment, affect allows him to judge what he perceives [7]; cognition is the analytical, rational part of information treatment, affect is intuitive and experiential [8]. And we know that an interaction impacts on the affective experience Human-Objects [9].

We can design objects for the desired cognitive and affective response; to understand cognitive and affective mechanisms of human perception is important the User Experience. This experience results from the interplay of a wide range of concrete (form, color, semantic, function) and abstract (affective and sensorial quality, semantic quality, aesthetic quality) product dimensions; and, through

analysis of relations between concrete and abstract dimensions, indicated by the participants that classical product design characteristics like form, color, material and style were often linked among each other; however, links with emotions and sensations were very few [10].

The humans experience emotional episodes induced by an object but also independently of any stimulus [11]. Krugman's [12] early definition of involvement emphasized the tendency to make personal connections between one's own life and the stimulus, explicitly excluding components such as attention, interest, or excitement.

Some research, started in the 1980s, related and evaluated internal patients' welfare with creating and designing spaces in residential and hospital treatment. It was shown that when these spaces were attached to nature through images, materials, textures, sounds, lights, ornaments, etc., calm appeared in a patient's condition, leading to decreased blood pressure and reduced medication load [13–16]. Moreover, current consumer-related market trends analyzed by research centers (within the habitat area) have reflected consumer need to establish contact and closeness with nature [17].

Product design inspired and produced from Natural Amazonian Resources will justify a different project, focused on specific products oriented towards the user's needs and desires regarding the human perception and knowing the characteristics of the raw materials that are local and unique.

2.1 *Natural Amazon Resources*

In this context, the aim is to give special attention to the Natural Fiber and Woods from the Brazilian Amazon, especially those used for craft work, because they have a variety of native species and be employed by the popular knowledge, suggesting the possibility of its transformation and integration with other raw material widely studied and well positioned in the market, also of natural origin—*Pedra Mármore Branco de Portugal com veios*-, for product development, with sociocultural, technological and eco-sustainable expression, contributing to the improvement of producing communities, the market and its potential consumers across borders.

Natural fibers and woods from Amazons, have been the focus of many researchers in recent years in search for new materials that present themselves as a unique opportunity to find alternative and innovative solutions. This means moving toward success, winning dominant and promising positions [18]. The interest for these types of raw materials is a function of being less abrasive to processing equipment when compared with other features—they are renewable, biodegradable

and recyclable, allowing them to compete with other fossil fuels and industrial materials [19].

Fiber: Tucumã-i. The fiber used comes from *tucum* originated by *Astrocaryum* genre of *acaule* species, known as *tucumã-i*, which is a palm-class located in the *Alto do Rio Negro* region (Amazonas state) where it is produced, grown and handled sustainable and handcrafted by indigenous and mestizo communities [20], being singled as a major supplier of natural fibers for these activities [21].

This species has a predominantly underground stem upland or lowland, measuring between 6–15 m high, having large foliage and coloring in dark green. According to Miranda et al. [22] their economic capabilities are centered on the leaves, with the extraction of high-strength fibers. Its production method seeks to comply with the rules of the World Commission on the environment, created by the UN, trying to make her a natural resource capable of generating employment and better living conditions for their producing communities [23]. Moreover, the fiber excels in its region for its resistance, absence of toxic components, possibility of textile applications and the ability to generate a wide variety of products [24]. About its commercialization, this is done through the purchase and sale of fiber in your state in nature, or already turned into handmade product, the main markets to Amazonas state capital (Manaus), some Brazilian states and some countries of America North, South America and Europe [25].

Wood: Cedrinho, Maçaranduba e Itauba. The woods from rainforests are commonly appreciated for their quality and exotic colors present in most species, besides the fact that there are plenty of possibilities to do a significant quantity of products from your trees [26].

The *Scleronema micranthum* species, commonly referred as “*Cedrinho*” [27], is classified as heavy wood, and is depicted with little resistance to fungi and termites, has density of 0.75 g/m^3 and is suitable for construction, interior carpentry, roof structures, and other products. Its color is among the most appreciated shade of tropical wood, with brown colored sapwood/brown and reddish brown heartwood.

The second selected species, “*Maçaranduba*” presents the core of dark brown-red color, and excellent machining qualities. Endowed with the scientific name of *Manilkara huberi*, this wood is very coveted by the ease of working, as well as get a good finish, is durable and resistant (density $1,10 \text{ g/m}^3$). Silva [27] also lists numerous possibilities for the use of this species, which ranges from more rustic objects such as poles and beams, to more sophisticated objects such as musical instruments.

The third species selected for the products of this research is scientifically termed as *Mezilaurus Itauba* with yellow-olive to brown heartwood dark wood, this species gets a good finish and can be considered a heavy wood (0.85 g/m^3), aimed mainly shipbuilding and construction.



Fig. 1 Production of some pieces with marble (on CEVALOR—Portugal), Tucumã and wood (at UFAM, in Manaus—Brazil). Source(s): From project archives

2.2 Product Design

The greater impact of product design research it's on the initial stages of the creative process [28] in this case, focusing on how to achieve the requirements of the user perception and emotions transmitted by the uniqueness of the raw materials.

The developed products were the result of a cultural exchange between two universities—*Universidade Federal do Amazonas* (UFAM, Manaus—Brazil) and *Universitat Politècnica de Valencia* (UPV, Valencia—Spain) and a technological transfer between two centers—*Instituto Nacional de Pesquisa do Amazonas* (INPA, Manaus—Brazil) and the *Centro Tecnológico da Pedra Portuguesa* (CEVALOR, Borba—Portugal)—involving two European countries and Brazil [29].

The idealization of the proposals was carried out by the students of UPV and UFAM, taking as inspiration the Amazonian Fauna and Flora [30]. The prototypes were produced firstly in Portugal, CEVALOR, all pieces of marble; and after in Manaus, at UFAM and INPA, all the pieces of fiber and wood—pictures above, Fig. 1. All products have been handled by the students, and the final results were 13 products that combine different materials—next figure show some of these products, Fig. 2.



Fig. 2 Some of the products. Source(s): From project archives

3 Method

Participants. In total 185 individuals participated in the study, interviewed in Brazil (57 %) and in Spain (43 %). They were majority women (62 %), students (85 %), between 17 and 30 years old (85 %).

Stimuli. The interviews were conducted during the presentation of prototypes made in design schools of each of the universities integrated on the project: UFAM

in October and the UPV in November 2015; and only the students, teachers and technicians of each design school are invited to participate.

Design. To measure the variables of the study we create a questionnaire demanding some aspects about the materials, focus on the design aspects. Two types of questions were used, closed-ended and Likert-scale questions (from 1 meaning ‘not important’ to 4 ‘very important’).

Procedure. All interviews followed a similar procedure. Firstly, the researcher, or a student instructed, comes into contact with the visitor to explain him the objectives of the project and obtain his consent to do the interview; after this, the researcher makes a guided tour with the interviewee, to present to him the products, talking about the materials, the finishes and doing some description about the processes of prototypes production; finally, the data are registered in a form on paper, with a pen. Data analysis was carried out after the exhibitions, using as a support the SPSS software to do frequency analysis and average reckoning.

4 Results

The results show that the users appreciate ‘a lot’ the majority of Design Values linked to characteristics of the materials questioned, consult (Fig. 3).

The Design Values more appreciate as ‘a lot’ was the Finishes, the Uniqueness, the Texture, the Resistance, and the Friendly aspect; however, the aspect Impermeability was the least appreciated.

When we asked to identify the most outstanding Design Attributes in the products exhibited, the big majority signalized the Formal Attributes, as you can see on Fig. 4.

Of the 185 people interviewed, only 10 respondents (5 %) classifies the Ergonomy as the Design Attributes most prominent in our products. In this study, we identify this little group of people and highlight the Design Values that they most appreciate on these products.

Group ID. They are all young students, eight of them are between 17 to 20 years old and two are between 21 to 30 years old. The half part of this group are women and the another part are men; and, seven of them was interviewed in Spain and three in Brazil.

Design Values. As we can see on the next figure (Fig. 5), the Design Values that this group of people appreciate as ‘a lot’ in this products are substantially the same, that the global of the sample.

These values include the Uniqueness, the Friendly and the Finishes of the product, and, as well as the global sample, the Impermeability as the value fewer appreciated.

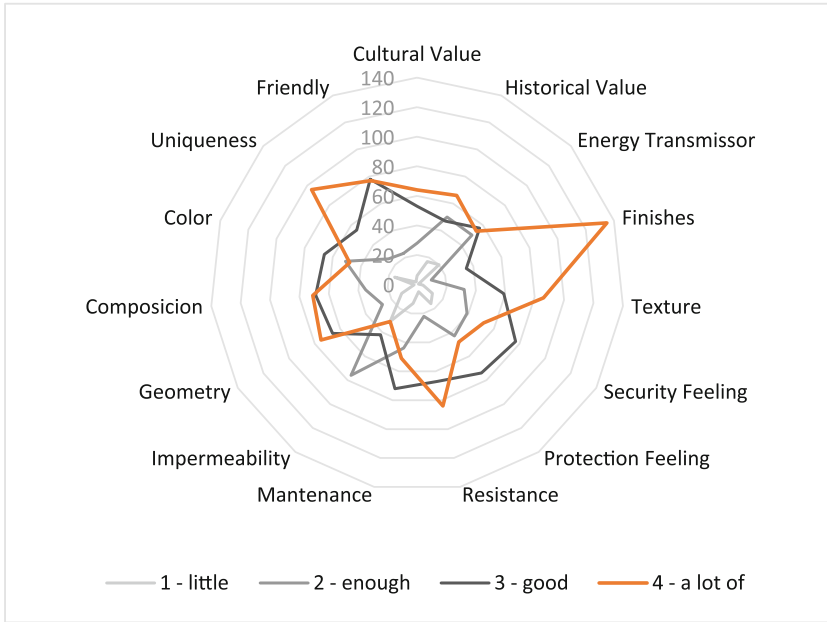


Fig. 3 Design values. Source(s): Created by the authors

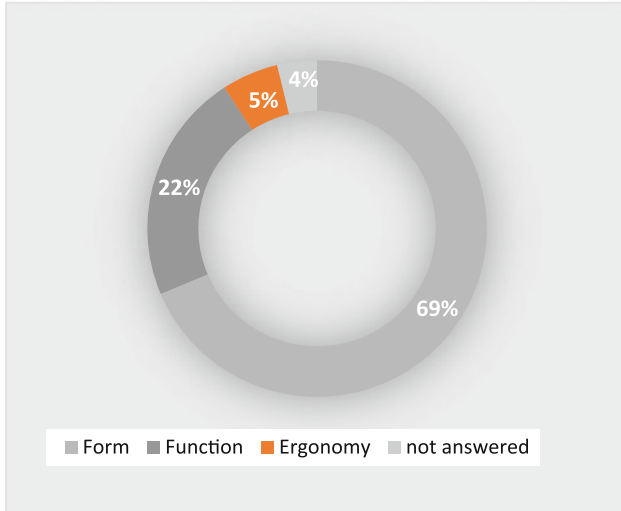


Fig. 4 Design attributes. Source(s): Created by the authors

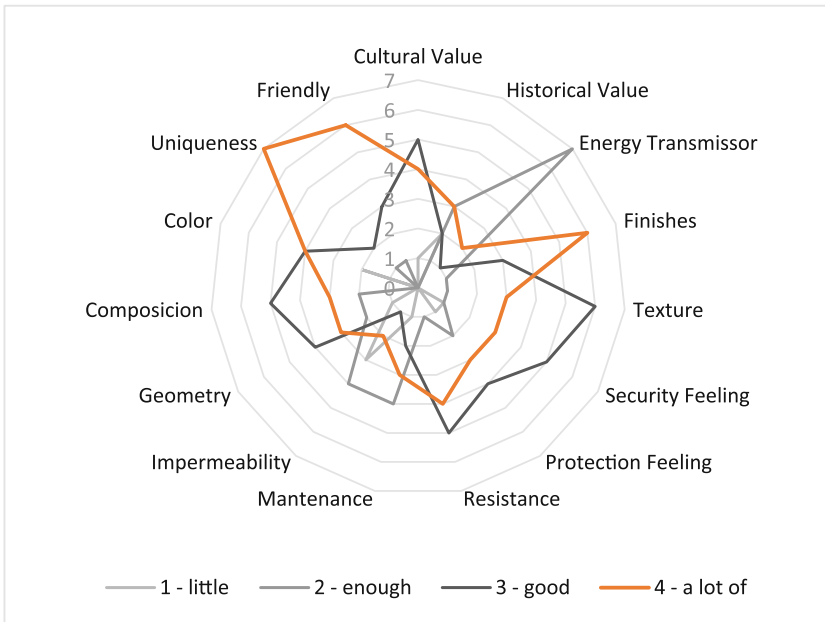


Fig. 5 Design attributes. Source(s): Created by the authors

5 Conclusions

The presented study broadened the affective and pleasurable values that ergonomics provides to the product design inspired and produced from natural Amazon resources, through analysis of a wide range of concrete (texture, color, resistance, geometry) and abstract (friendly, protection and security feelings, cultural and historical values) product dimensions. We introduced the prototypes to the participants and then we assigned the task to evaluate the Design Values linked to the characteristics of the material most appreciated on the products exposed. Various concrete dimensions, associated to the functionality of the product, among them Finishes, Texture and Resistance appeared as the most appreciate Design Values. Nevertheless, the participants appreciate also the some abstract dimensions closer to the affective mechanisms of human perception, like the Friendly and Uniqueness aspects.

The association of abstract values with the ergonomics of a product are not obvious to the majority of participants, although appreciated, Ergonomics is highlighted only for a minority of contestants. This minority are coherent, and appreciate above all the abstract dimensions of the product.

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