

The perception of pleasantness in a product of collective use: the bus shelter

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Abstract. This article presents a study on the identification of a setting whose arrangement of attributes could lead to the perception of pleasantness of a bus shelter: a product that should welcome people while waiting for the bus. Two different bus shelters typologies in the city of Porto Alegre, state of Rio Grande do Sul, Brazil, were evaluated, where four attributes were under consideration. The relation between the shelters subject of the study and the surroundings was significant for defining the attributes. The setting with curve shaped cover, bench, rear wall, and surrounding vegetation was considered the most pleasant one. The seats and the rear wall were associated with the practical function of the product while the curve shaped cover and the surrounding vegetation were associated with the aesthetical function according to the participant users.

Keywords: emotional design; pleasantness; bus shelter; product attributes; product functions

1. Introduction

The bus shelter, street furniture that belongs to the “transit and transport” category according to a Brazilian official rule [2], represents a small part in the public transportation system, which is a subject of great interest to all societies due to environmental and social demand. However, as Hensher [2007] points out, the bus is seen as a means of support to the mobility and accessibility little attractive and glamorous, despite its importance in the users’ lives and the opportunity of sustainability it can offer. The author admits that attracting users to use public transportation, in general, and buses, in particular, is a growing challenge and still more difficult in economies that are going towards a higher level of wealth and economic efficiency, where the desire and the capacity of having and using a car will keep affecting the future of all means of public transportation [7].

In this context, we call the attention to the need of thinking in the field of Emotional Design, with the focus on products of collective use, since we interact daily with a great amount of different kinds of products, among them the ones classified as *products for the use of specific groups* [5]. For Löbach [2001], the relations between products used by large groups of unknown users (as the street furniture) tend to have an irresponsible use due to the lack of individual consciousness of co-ownership with the product and because there is no identification with it. He argues that the general needs of the group must be considered in the project process, so the result will please most users [5].

Emotion in design has been under discussion in order to promote the development of product solutions that are more pleasant for the users [11,20, 24]. This article presents a study on the identification of attributes that could lead to the

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perception of pleasantness of a bus shelter: a product with a strong collective interest that should be responsible for welcoming people during the waiting for the bus [10].

The primary research question of this study addressed the attributes that could make the bus shelter a pleasant product for the users. For this purpose, the investigation of attributes had its start with a Focus Group, who were presented two images of real scenes, containing two predominant typologies of bus shelters in the city of Porto Alegre, Brazil. The city hall has recently created a commission of analysis and implementation of street furniture in order to suspend the contracts with the current suppliers and have new bids due to the difficulties with the existing furniture. According to the commission's president, the city's street furniture does not embellish the city as well as neither informs nor offers comfort and security/safety to its users [16]. The images presented with the two studied typologies consist of real landscapes in order to keep the relation of those shelters with their surroundings.

The qualitative method applied raised four attributes or main factors: the seat, the presence of vegetation in the immediate surroundings, bus shelter rear wall for rain protection and formal aspects of the shelter's roof. Departing from the interaction of these attributes and their levels, their own specific characteristics, the study aimed at pointing out which bus shelter setting better communicates pleasantness to the subjects of the study in their wait for a bus. In addition to that, a comparison between perceptions from the different surveyed groups was made, considering the maturity level of the subjects since they are students from the first and last semester of three graduation courses at the Federal University of RS – UFRGS.

2. The perception of pleasantness in the use of street furniture and its relation to the surroundings

The perception of pleasantness in the use of street furniture follows Jordan's [2000] approach; for him, it is not possible to consider only the practical use of the product because it excludes issues such as aesthetics, semantics, the sensory elements and values that the street furniture expresses. Therefore, this approach defends the idea that, besides

efficiency and functionality, the products should also promote pleasant experiences to their users.

Jordan [2000] emphasizes that pleasantness is not just about one property of a product, but it is about the interaction of the user with the product. According to him, this interaction must have as a result some kind of pleasure to the user and bring him emotional benefits in addition to being pleasant. Therefore, the pleasantness for the author is associated with pleasure and can be understood from the structure of the four pleasures, elaborated by anthropologist Lionel Tiger [20]: *physiological pleasure*: derived from the human senses (touch, taste, hearing, smell, and sight); *social pleasure*: related to contacts, the personal image and status (found in products and services that can facilitate social interaction); *psychological pleasure*: related to cognitive and emotional reactions of people (found in objects that are easily usable); *ideological pleasure*: related to a set of beliefs and values, including taste, moral values and social aspirations (it is related to the objects' aesthetics and the values they embody).

The perception of pleasantness in the use of bus shelters, according to what Jordan [2000] defends, should consider the relation between the user and the bus shelter and their relation with the surroundings where the shelter is placed. It is believed that the pure simple perception of a shelter, like a product in a catalogue, could affect the user's judgment regarding emotional matters. By relating to the surrounding elements and by being designed to fulfill specific functions, the street furniture influences the individual's perception of a specific space [9]. John and Reis [2010] also call the attention to the need for studies on street furniture and its relation with the surroundings so that the influence of those elements on the visual quality of the landscape and on the space use can be considered from the users' perspective. Moreover, the relations between the different types of street furniture must be considered since they can be a factor of interference in the image people have of a city, contributing to make the environment *pleasant* or *unpleasant* to its users [18].

The word 'please', synonym of content and satisfaction [3], is also mentioned by Liu [2003] when referring to one of the five dimensions that allow distinguishing the main aspects related to the project of systems and products – the aesthetic/affective dimension, which is about the aesthetic/affective valuation of a stimulus or of a product in use, ranging from a negative extreme

(unpleasant, not attractive) to a positive extreme (pleasant, attractive), passing by a neutral point [20].

3. The bus shelter product and the functions of industrial products

The bus shelter, which is currently manufactured and sold by worldwide companies such as the street furniture suppliers JCDecaux (French) and Cemusa (Spanish), is characterized as an industrial product in this study that, like any other, must fulfill its three main functions: practical, aesthetic and symbolic, according to Löbach [2001] or, according to Burdek [2006], indicative functions, which refer to practical and language functions, that incorporate the aesthetic and symbolic ones [4]. The former author explains that the products have various functions, but they follow an importance hierarchy, hence the need for knowing not only the practical, but also the psychic and social necessities of the group of users.

Those three basic functions have different weights according to the product or the user's need: the practical function weighs more when it is still necessary to fulfill the need of the product's use and the aesthetic and symbolic functions prevail when the primary function has been fulfilled [17]. Considering the four attributes brought up, in the surveyed users' perception, the practical function weighed more in relation to "bench" and "rear wall" and the aesthetics hierarchically prevailed regarding the attribute "vegetation" and "shelter's cover". Despite the importance of a survey on the aesthetic preference of the future users, the designers rarely have the opportunity of doing it and the product briefings commonly point out the elements linked to its practical function [5].

The fulfillment of the aesthetic function is a fundamental condition for the architect and urban planner Sieverts [2011] who argues that beauty is one of the prerequisites of a sustainable city. Agreeing with Löbach [2001], he says that if something is neither beautiful nor meaningful, people do not take care of it and do not develop responsibility for it [23].

Nowadays, most products of use are technically mature and their success in the market depends mostly on products that *please* the users in Lobach's [2001] opinion. However, in Brazil, unfortunately, this is still not a reality that can be measured in the use of most *products for specific groups* [5], like the street furniture bus shelter.

On the other hand, industrial products that bear practical functions have symbolic dimensions, which are used to being induced by aesthetic features of the product [5] and determine, to a great extent, the emotional relation between the user and the product [8]. In the symbolic dimension, the bus shelter is a meaning carrier that expresses something about the user's life habits like any other industrial product. For instance, in an ideal context, regardless of their means, the users could feel respected for making use of the public transportation and helping the environment if they were welcomed in a bus shelter of quality. In this case, they would have *social pleasure* [20], which is accomplished by interacting with other individuals, and *ideological pleasure* [20], which is related to values and beliefs. Contrariwise, the users could feel worthless or diminished by having to use a bus shelter that lacked its practical, aesthetic and symbolic functions.

4. Bus shelter attributes

This study will focus on the four attributes pointed out by users in the qualitative method used: bench, surrounding vegetation, rear wall for rain protection and formal aspects of the shelter cover.

4.1 Attribute 1: bus shelter seat typology

The bus shelters need benches for comfort during the wait, since they gather people in a moment of pause and tiredness [22,25]. The sitting posture is considered less stressful than the standing one, because the body has better support due to the variety of media available: floor, seat, backrest and armrests [17]. However, proper posture is directly related to the activity performed. During long periods of waiting, the stress on the legs can be caused by dynamic repetitive efforts - when the user is standing and moving and / or static - in a standing position and not moving. In addition to this, there is the stress on the legs coming from the user walking to the bus shelter and also the activities he performs daily.

According to some authors [19], the environment, the activities in the shelter, itinerary information and mainly the possibility of sitting lower levels of the stress of waiting. Moreover, users who remain standing tend to feel more irritated than those who sit down to wait. Furthermore, users sitting are more likely to carry out an activity while waiting for transportation, precisely because of the simultaneous

mobility of hands and feet quoted by Iida [2005]. Still, it was found that the irritation level is higher in elderly users than among non-elderly [19] when they wait for a bus standing up. However, the importance of ergonomic principles for the design and selection of seats is essential [13,17,22]. Also, the seats must be retreated not to block the passage, particularly for people on wheel chairs. [22,25]

Shelters located in bus lanes in Porto Alegre offer a tube attached to its metal frame for user's support (Figure 1). The use of the tube may be associated with the standing / sitting seat, which is based on the concept of zero gravity posture where the subject takes an angle of 135 degrees between the torso and thigh [15]. To do so, however, the height of the tube should be adequate to the lowest percentile, which hardly happens in those shelters, whose horizontal bars are not placed at a neither standard, nor right height.

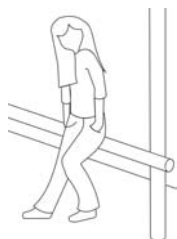


Fig. 1: Tube to support buttocks and/or backrest for the users.



Fig. 2: Saddle to support buttocks in long-time standing position [14].

4.2 Attribute 2: the surrounding vegetation

The importance of the presence of vegetation in cities is evident in its practical-functional configuration: the strong influence on the environmental comfort, which includes thermal comfort, light, acoustic, ergonomic and psychological, especially on the thermal comfort and psychosocial issues of the environment [1]. Equipped with color, texture and other characteristics, the vegetation has visual and aesthetic properties that can be used as a tool for developing the urban environment. The shape, size, foliage, flowering, fruit and the design of trunks, branches and roots are examples of elements that stimulate awareness and that can be exploited in the pursuit of aesthetic quality. In relation to the symbolic function, like any product, other characteristics of the vegetation can communicate the status of a higher class, for example, the value of novelty, the rarity of the

species, the difficulty of access to it and its high price.

4.3 Attribute 3: bus shelter cover shape

The bus shelter's cover shape has as its main practical function the protection against the climate, like the sun, rain and wind. As for the protection against rain, Freitas [2008] states that the cover inclination should be to the back, on the opposite of the sidewalk borderline for the rain not to fall over or before the users.

In contrast, the design issues are linked to the aesthetic function of the product. According to Morris [2010], there is a trend towards smooth shapes and organic curves, which reflect the nature and the natural shapes, where it is rare to find straight angles: "The organic lines can give the product aesthetics and a simplicity feeling, and this trend was made easier by the computerized modeling of solids and surfaces, combined with the advances in industrial techniques" [21, p.62]. The tubular shape of the bus shelters in the city of Curitiba, Brazil, which according to Morris [21] are inspiring and iconic, with predominantly curve lines, presents itself as something new and innovating from a point of view not only functional and useful, but also aesthetic and symbolic; this way the urban elements created for a specific end and for a specific space gain a cultural and symbolic value for the community where they are placed.

In the covers of the two typologies studied there are shelters with a predominance of straight lines – park bus shelter (Figure 3) and curved lines – bus lane shelter (Figure 4).

4.4 Attribute 4: the rear wall

The shelters are often provided with walls, at the sides and at the rear, to reduce the effects of rain and wind [22,25], which are usually manufactured in glass, acrylic or another transparent material [22]. The side walls tend to be used as an area for media to inform the lines' itineraries and/or for advertising. Nonetheless, the lateral walls must be minimum in order to allow the surrounding view [22].

The typology of straight cover had one of its lateral closed with back-lights, which later had to be removed due to vandalism, and the iron structure left is now used as seat by the users. The typology studied at the bus lanes does not present side or rear

walls, and one of the main complaints from the surveyed users and Focus Group is the lack of protection from the rain coming from behind the shelter, because, unlike the street pieces, at the bus lanes vehicles pass less than a meter from what would be the “rear wall” of the shelter.

5. Method

In quantitative research tool was used conjoint analysis, which aims to estimate the effect of attributes and their interactions on the pleasantness of the bus stops.

5.1 Definition of attributes and their levels

The bus shelter attributes originated with the Focus Group of twelve students, daily bus users, who attend the first and the last semester of architecture, design and production engineering at UFRGS. The group of students analyzed images of real landscape shelters, Figure 4 (bus lane shelter) and Figure 3 (park bus shelter). Subsequently, the results obtained in the Focus Group were also reviewed through individual interviews with users in the two shelters subject of the study.



Fig. 3: Park bus shelter

The shelter of Figure 3, at Moinhos de Vento Park, was selected for presenting a single design: the waiting area received a circular advance to the park, where wooden benches with backrest were placed.

The Figure 5 shows the key attributes identified by the sample of users with the identification of positive and negative factors.



Fig. 4: Bus lane shelter typology

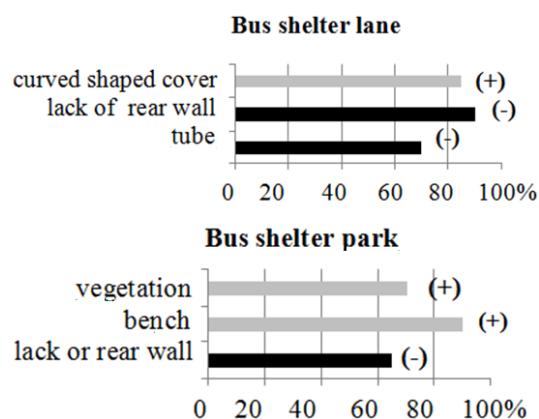


Fig. 5: Positive and negative predominant attributes

Table 1 shows the relationship of the predominant attributes with their levels (which are specific qualities and attributes of their possible variations).

Table 1: Attributes and it levels

Attributes	Low level (-)	High level (+)
A= seat	tube	seat
B= vegetation	without	with
C= cover	straight	curved
D= vertical closing	without	with

5.2 Building up the settings

The combination of attributes and their levels (Table 1) created a factorial experiment of type 2 creating 16 complete settings, or hypothetical bus

shelters, that were structured using orthogonality concepts (Table 2). The settings were divided into four blocks and in each block the same attribute is present (the same number of times) in high and low level.

5.3 Building up the questionnaires

Regarding the answer analysis, this study used stimulation in two stages, proposed by Caten and Battesini [2001]: firstly, the respondents were encouraged to select a complete setting from each block. Secondly, the respondents gave an evaluation for the previously selected setting [6]. The way of completing the chosen setting evaluation in each card was based on a scale of continuous evaluation suggested by Stone et al. [1974], where on a 15 centimeter line the user marks what represents his perception of each formulated setting [12]. Two anchors were placed on the ends under the line, ranging the intensity of each answer from 0 (unpleasant) and 15 (pleasant) and the weight of each answer is measured by its arithmetic average. The anchors followed Liu’s [2003] suggestion, with the exception of a neutral point. There were lines below the anchors in case the respondent wanted to justify his choice.

5.4 The users’ population







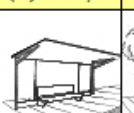



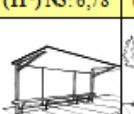


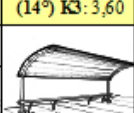
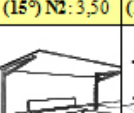

Due to the large number of people, it was decided not to sample the population who compose the bus users from Porto Alegre. A population of students was selected from three different graduation courses of the UFRGS: Architecture and Urbanism, Design and Production Engineering; more specifically, the population of students from first and last semesters from the respective courses. The reasons for choosing those courses were: (i) the buildings are located closed to the bus shelter typology subject of the study and, at the same time, the shelters are close to each other; (ii) the architecture and design courses have in common that fact that they enable students to develop projects, unlike production engineering; and (iii) the senior students from the three courses have the spatial perception more developed than the freshmen, what contributes for the comparison between students in the beginning of the course and the ones ending it.

Regarding the stratification, the gender variable was used. The users’ totaled 188 students.

6. Results

The results have shown that, even with four attributes and their levels, interactions were possible to identify a bus shelter setting that communicated pleasantness to the population of surveyed students and was different from the two predominant typologies, which exist in the city of Porto Alegre and were subject of this study. Table 2 shows the 16 settings presented in the questionnaire and their respective averages in decreasing order: from the most pleasant setting (average 12.89) to least pleasant one (average 2.78).

Table 2: Ranking of the settings and their general average.

Settings			
(1°) N4:12,89	(2°) L1:12,27	(3°) M2:11,74	(4°) K1:11,19
			
(5°) M1:10,67	(6°) K2:9,41	(7°) M3:9,24	(8°) K4:8,97
			
(9°) N1:8,59	(10°) L3:6,91	(11°) N3:6,78	(12°) L2:6,22
			
(13°) L4:3,99	(14°) K3:3,60	(15°) N2:3,50	(16°) M4:2,78
			

The setting which best communicated pleasantness to the population of surveyed users has the high-level attribute interaction: bench, surrounding vegetation, curved cover and rear wall.

The first four settings, which had the highest averages, have the rear wall, which lacked in the four last ones that were considered the least pleasant. The results show clearly the need for supplying an important practical function of the product that was not fulfilled in the studied typologies: to reduce the effects of the rain and wind [22,25].

On the other hand, two attributes, which had their aesthetic function evident in the Focus Group, are

present in the most pleasant setting: the vegetation and cover with curved lines. The presence of the vegetation attribute indicates that the vegetation has visual and aesthetic properties that can be used as a tool for developing a better urban environment. Regarding the curved lines of the shelter, they can indicate a trend towards smooth shapes and organic curves in the products [21].

As for the respondent's gender in relation to the settings at Table 2, by means of test t for two independent samples, there is significant statistical evidence that the average between the two gender groups are different for the setting L3 (Table 2), whose female punctuation was under the average (5.7) and the male one was over the average (8.0). Thus, the female students consider the setting with curved cover, rear wall, without bench and surrounding vegetation significantly less pleasant than the male students do. This result may indicate that the female students have more predisposition to sit while waiting for a bus and value more the aesthetic function of vegetation than the male students do. It should be pointed out that culturally, in our society, men are raised to offer women the seats, as a matter of courtesy.

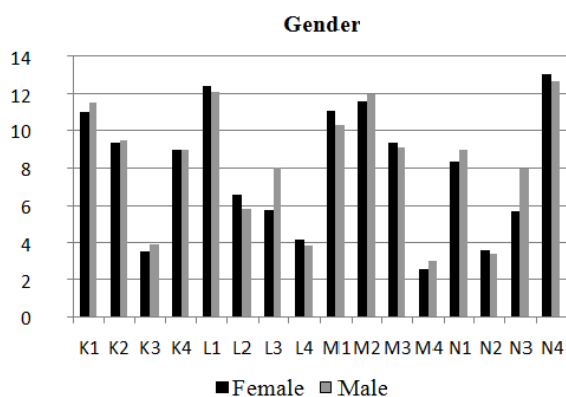


Fig. 6: Gender average punctuation

Regarding the graduation courses, by the Analyses of Variance – ANOVA for one factor there is evidence that at least two averages of the study group differ from each other on the pleasantness: settings K2 and M3. The Tukey test, for multiple comparisons, identified that, for the setting K2 (which has all attributes in high level, with the exception of vegetation), there is significant statistical evidence that the average between the

Architecture and Design, Architecture and Production Engineering groups are different, and the lack of vegetation in the setting was felt more by the architecture students in both comparisons. For setting M3 (without vegetation and flat cover) there is significant statistical evidence that the averages between the production engineering versus architecture groups are different, where the aesthetical function of the cover and vegetation is more valued by the architecture than the engineering students.

Through the non-parametric Mann-Whitney U test for two independent samples, there is significant evidence that the averages between the students from first and last semester are different for the setting L1 and L4. The flat cover from setting L1, with rear wall, vegetation and bench is significantly more pleasant than the curved cover, with bench from L4, but without rear wall and vegetation.

In comparison between the last semester groups of architecture and of design (together) versus the last semester group of production engineering, it was observed that the averages differ for the setting L3, where the lack of seat and vegetation makes the setting significantly less pleasant for the group whose courses give more emphasis on project.

In agreement with the authors [9,18], the findings showed that the images, which included the surroundings where the shelters were inserted, were fundamental to identify the attributes.

Vegetation added value to the settings, mainly for the female students.

The in loco interviews, which were made to confirm the results gotten from the Focus Group, confirmed that the use of a bus shelter lacking quality can affect the user's personal appearance when waiting for a bus, preventing him from his *social pleasure* [20] and contributing to make the bus little glamorous and attractive means of transportation, as Hensher [7] believes. It is important to have in mind that, in Brazil, the users of public transportation are mostly people with less purchasing power, that can already have some inferiority complex in relation to the people who drive by the bus shelter. However, the idea is not to disguise this difference, but to contribute to improve the urban public transportation system, identifying a more pleasant bus shelter in order to have more people using the bus.

Obviously, that will only happen if the other components of the system are reconsidered, for instance, an increase in the number of buses to avoid waiting long, and concern with the bus' comfort and

accessibility. By doing that, the bus shelter becomes an incentive for the increase in the demand for the public transportation use, relieving the traffic in the city, reducing pollution and fuel consumption. Moreover, that can fulfill another function: *the ecological one* [17].

7. Conclusion

This paper has proposed developing hypothetically settings of bus shelters based on the interaction of positive and negative attributes that are present in two predominant typologies of bus shelter in a southern capital city in Brazil aiming at identifying two predominant typologies of bus shelter in a southern capital city in Brazil aiming at identifying the setting that best communicates pleasantness to a group of users. The applied method was efficient to identify and arrange the attributes; and the vegetation and cover were analyzed beyond the product's practical function. The number of students was enough to provide information on the studied subject and, even with maturity difference between students from first and last semesters regarding spatial perception and different skills addressed in the graduation courses (architecture and design versus engineering), a consensus of opinions on the "pleasant setting" composed by the attributes vegetation and seats was observed.

Although the bus shelter is a minor item of the entire public transportation system, the improvement of the equipment is important for making people attracted to use the bus.

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