

Analysis of the impacts of the urban traffic in the quality of life: an application of the Lens Model

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ABSTRACT: The research a proposal is utilization *Single System Lens Model* based on the of *Social Judgment Theory* (SJT) which provides the identification of inhabitants and transport specialists of the variables that describe the impact of the traffic (sound and atmospheric pollution) and the conditions of traffic (average speed of private vehicle, vehicular flow, composition of the traffic etc) in certain urban area which is subjected to intense circulation of vehicles, especially, through traffic; to verify whether there is an agreement or not among the inhabitants and transport specialists with relation to the perception of the impacts and the conditions of road traffic; to propose a methodology that can be used by local authorities to evaluate the acceptance by the population about some public policies. A case study was carried out in the neighborhood of Botafogo, located in the city of Rio de Janeiro.

Several consequences caused by transport can be seen in a region. Those can be either positive or negative. Among the positive ones, we can point out the improvement in local business, leading a better access to goods and services by population, thus encouraging the economic development of the region on the other hand, the negative aspects can be pointed out: land depreciation, air pollution, vibration, noise, segregation, environmental urbane mainly the flora and fauna.

In relation to big Brazilian cities like São Paulo and Rio de Janeiro, one can observe the chaos in the transit, expressed by frequent congestion, poorly planed synchronization of traffic lights and information signs out of pattern, wisp laced bus stops and mainly the lack of safety in the streets, noise, atmospheric pollution, among others, compromising the urban quality of life. According to Yang *et al* (1997), “some possible strategies to deal with traffic problems and improve the quality of life in urban areas comprise: improving vehicle technology; alternative fuels for transport systems; increasing public transport use; car use restrictions (road pricing, parking restrictions); reducing the need to travel; increasing walking and cycling trips”.

The aim of this study is utilization *Social Judgment Theory* (SJT). The hypothesis of this research is that there is a conflict between the inhabitants and transport specialists with relation to the judgment on

the impact of the traffic in the quality of the urban space.

After several analysis of possible sites to be studied, the present work was based on the conflicts existing in the district of Botafogo in the city of Rio de Janeiro, where the intense through traffic, mainly in local streets, opposes to many, aspects of quality of life, in eluding those related to accessibility, mobility, habitability and sustainability of the residents and patrons of local activities.

However, due to financial and time restrictions, the amount of roads selected, was based upon: level of traffic flow, number of traffic accidents and type and use of the land. Then, four locations were selected, two local streets (Paulo Barreto and Assis Bueno) and two arterial streets (Prof. Álvaro Rodrigues and Paulo Barreto).

1 MODEL USED

The main focus of this study will be based on the application of the psycho logic theory of human judgment, which provides mechanisms to measure the perception of the individuals or groups of individuals and to approach the problem of the conflict of interest or district visions of two groups involved on the judgment. This theory is based on *Lens Model* created by Brunswick (1952).

Lens Model presents different patterns, and is well accepted in studies that treat social judgment. According to Athanasou (1998), "Lens model analyses are based on both integrating and decomposing repeated responses to a situation; they are computationally intensive, producing as much statistical/computer output for a single person as many entire studies of whole populations; they are not well known in general psychology but they have been tried and tested, especially in the area of judgments, medicine, social policy, organisational behaviour, and decision process".

For the present study, the *Single System Lens Model* (figure 1) was applied which relates the diagnostic of the participating group to the environment. However, the objective measure, which better represents the environment to be analyzed, could not be identified.

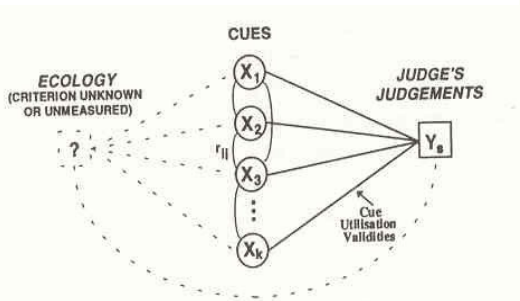


Figure 1: Single System Lens Model (COOKSEY, 1996).

where:

- (X_i) Relationship between the individual's judgment and the set of are variables;
- (Y_s) Dependent variables concerning the group's judgment.

The cue utilization validities are represented per the betas or beta weights, which are the regression coefficients to be used with Standard scores, when all the obtained scores in a set of data are transformed to Standard scores.

In relation to the recent studies concerning the *Social Judgment Theory* (SJT), witch the abstract can be found on site Brunswick Society's, in section of the Newsletter comprising several areas of knowledge: medicine (see Hamm, 2003), such decision process (see Athanasou, 2003; Dal Santo, 2003) and other.

In Brazil the SJT is not widely used, and very few publications were found on the bibliography review. The review features some researches as Gonzales (1996) *Social Judgment Theory in Brazil*; Braga (1989) *the vehicle drivers' perception of attributes of the road environment that influence safety at four-arm uncontrolled junctions*. The only one that is related to transportation is Braga (1989). This fact makes the present research a bit more interesting, because it will be a scientific study that involves the combination of the areas of psychology and transportation.

2 METHOD

2.1 Participants

For this study, the inhabitants of each street were selected as judges and the experts in transportation. Thirty inhabitants of each street were selected to represent the sample statistically. Those residents were picked on different buildings of the street, to comprise residents of several social levels and so to verify their perceptions in relation to matters related to traffic a quality of life. However, the choice of the inhabitants was performed on a random basis. Concerning to the quantify of residents it was due to the lack of initial data to obtain the respective statistical parameters (variation coefficient, deviation, mean) and also due to the quantity of experts in transportation available for this research.

2.2 Instrument

To obtain the diagnostics of the judges involved in the research the questionnaire technique was applied. The structure considered to shape the questionnaire included straightforward questions to the resident to be interviewed. The scale applied to obtain the answers was the Bi-polar semantic differential with 7 boxes, with which, according to Braga (1980), the public appears to me more familiar. A scale ranging from "I totally disagree" (value 1) to "I totally agree" (value 7). The schedule for the application of the questionnaires was the following:

Tuesday, Wednesday or Thursday from 7:00 am to 10:00 am (morning rush) or 5:00 pm to 7:00pm (afternoon rush). In relation to the experts in transportation, after being familiar to the questions, went through each street and made a final evaluation of each route. If more than one expert was in the street at the same time, they were instructed not to communicate to each other during the research. The evaluation of each street took about 10 minutes. Totally, considering the four streets and the time for locomotion among them, the research took about 50 minutes.

2.3 Attainment of the variables of study

Based on the four streets selected in the district of Botafogo, the main attributes or variables to be studied were established. The variables are: those that describe the traffic conditions (mean speed of the flow, delay for pedestrians, and percentage of heavy vehicles) and those that describe the impacts of the traffic on the environment (atmospheric and sound pollution).

2.4 Variable dependent related to the groups involved

It was designated as the best variable related to the streets analyzed (Xi) for the residents as “the importance of the transportation in their quality of life”, whereas for the for the experts “what is your opinion about the importance of the transportation in the quality of life of the population of the region? Then, those variables were inserted in the questionnaire and represented by “Yd” for the inhabitants and by “Yp” for the transport specialists.

2.5 Independent variables (ATx)

Those were originated from the variables analyzed in the questionnaire (Qx) and grouped, according to the following characteristics: mean speed (AT₁), safety (AT₂), traffic composition (AT₃), pedestrians (AT₄), atmospheric pollution (AT₅), segregation (AT₆), visual intrusion (AT₇), features of the street (AT₈), vehicular flow (AT₉), congestion (AT₁₀).

2.6 Analysis of the variables

Through the methods of multiple regression that identify and estimates the magnitude and significance of the dependent variable in the relation to the independent variables, the value of the variables were analyzed. The method used to obtain the analysis of the multiple regression was the “stepwise”

which allows to limit the number of independent variables. The criterion of the method is based on the probability of parameter F (F which tests the model of regression found, verifying its adjustment of data).

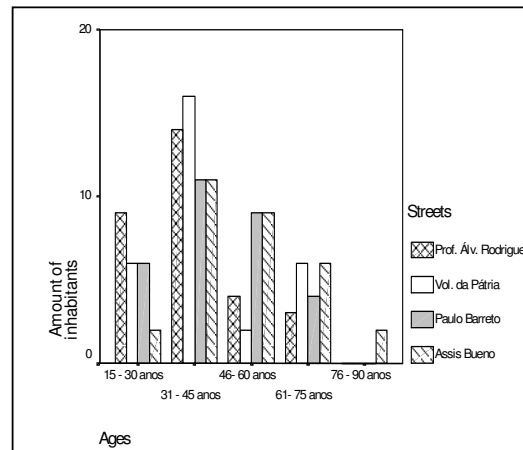
It is emphasized that the treatment of the data was done primarily on Excell 7.0 and lately, send to SPSS for windows, which is considered of god quality for statistics analysis.

3 RESULTS OF THE RESEACH

3.1 Residents Profile

The participants in this study comprised 120 inhabitants (55 male, 45 female). The range of ages of the residents interviewed by street is shown in graphic 1. The average is 39 years (street Prof. Álvaro Rodrigues), 43 years (street Voluntários da Pátria), 45 years (street Paulo Barreto) and 51 years (street Assis Bueno). In relation to the professional activity, it varies a bit (doctors, engineers etc). The degree of instruction of the inhabitants is split in to the following levels: 40,4% had 2° grade; 30,6% had a college degree; 25,6% had studied up to 1° grade and 3,4% had not instruction at all. It was noticed that 52% of the inhabitants were between the ages of 17 and 30 years; 46% were between 30 and 60 years and only 2% were more than 60 years. Concerning their profession, the residents were classified as follows: autonomous (32%); skillful workers (23%); administrative jobs (15,4%); teaching activities (15%); none skillful workers (10%) and others (4,6%).

Graphic 1: Ages of the inhabitants of the selections streets.



3.2 Experts in transportation profile

Concerning the transport specialists, 22 students in the M.Sc. level and 8 in the D.Sc. Level took part in this research, 7 of engineers were employed by CET-Rio (Traffic engineering Company). The average age the expert was 34 years. The professional background of the experts was in the areas of civil engineering, architecture, economics etc.).

3.3 A Single System Lens Model Analysis

Two different cases were considered for the final version. Those cases were defined from a minimum amount of values, in order to make the sample meaningful (30 observations). Cases with less than 30 observations were turned down statistically. Besides, the streets were grouped according to their role in the network. Thus, the cases analyzed were: inhabitants of Paulo Barreto and Assis Bueno streets x transport specialists; inhabitants of Prof. Álvaro Rodrigues and Voluntários da Pátria streets x transport specialists.

Tables 1 and table 2 represents the statistical parameters calculated from the application of the questionnaires and are essential to the comprehension of the perception of the participants in this study in relation to the conflicts in the urban space.

Table 1. Lens Model Indices to obtain of judgment transport specialists.

| Judges | Street | Rp ² | β | Relative importance (attribute) |
|-----------------------|---|-----------------|-------|---------------------------------|
| | Paulo Barreto/ Assis Bueno | 0.103 | 0.322 | Mean speed |
| Transport specialists | Prof. Álvaro Rodrigues/ Voluntários da Pátria | 0.170 | 0.313 | features of the street safety |

Note: R_p² = overall R squared for the transport specialists.
β = regression coefficients to be used with Standard scores.

Table 2. Lens Model Indices to obtain of judgment inhabitants.

| Judges | Street | R _d ² | β | Relative importance (attribute) |
|-------------|---|-----------------------------|-------|---------------------------------|
| | Paulo Barreto/ Assis Bueno | 0.233 | 0.483 | atmospheric pollution |
| inhabitants | Prof. Álvaro Rodrigues/ Voluntários da Pátria | 0.255 | 0.505 | traffic composition |

Note: R_d² = overall R squared for the residents.
β = regression coefficients to be used with Standard scores.

3.4 Single System Lens Model design for the capturing of judgment policy applied to this study

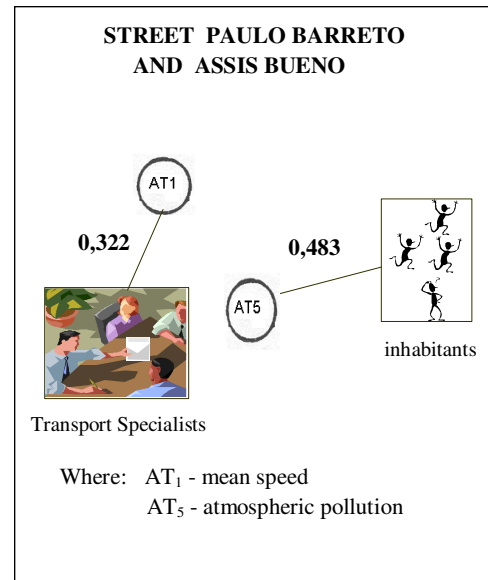


Figure2: Design capturing of judgment of the Groups (Transport specialists and Inhabitants) in street Paulo Barreto and Assis Bueno.

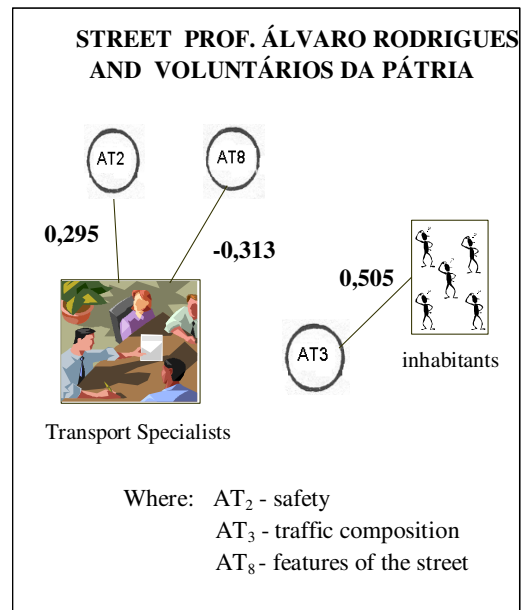


Figure 3: Design capturing of judgment of the groups (Transport specialists and inhabitants) in street Prof. Álvaro Rodrigues and Voluntários da Pátria.

4. CONCLUSION

It was observed in this study, the reduced compatibility between the judgment of the inhabitants in the streets analyzed and the transport specialists in relation to the aspects concerning the transportation and the quality of urban life.

Considering the importance of the quality of life, the variable atmospheric pollution “was the most relevant to the inhabitants of the local streets, whereas the variable “mean speed” was the most meaningful for the transport specialists.

For the arterial streets, the perception of the specialists pointed out the variables “features of the street” and “safety”, for the inhabitants, the variable “traffic composition”, or the percentage of heavy vehicles (buses and trucks) was the most relevant.

Another important fact related to this study, was the high correlation (r) between the variables “noise” and “percentage of heavy vehicles” in the streets analyzed, values like: Prof. Álvaro Rodrigues ($r = 0,992$), Voluntários da Pátria ($r = 0,911$), Paulo Barreto ($r = 0,907$) and Assis Bueno ($r = 0,777$).

Besides, the values obtained in the area of study for the variable “noise” in the arterial streets are above the acceptable patterns of comfort established by the state and federal law (70 dba for day time and 60 dba for night time). Such levels of noise set the residents of those streets in condition of “alert”, for the harmful consequences that can be caused to the human being like stress, fatigue etc.

The low values obtained for the coefficients of determination (R^2_p and R^2_d) can be explained by the fact that there are no other variables related to the culture and social and economic characteristics of the groups involved (inhabitants and transport specialists).

Some limitations concerning the model applied were verified like the autocorrelation observed between the residual terms and the presence of heteroscedasticity in some cases analyzed in this study. However, through the statistical correction tests, the errors found were minimized.

The results found in this study will provide subsidies and will be example in relation to: discussion to build a collective conscience concerning the importance of the city planning; equity in the distribution of responsibilities of a decision making; a better commitment of the community; a better knowledge of the perception of the community about similar problems; construction of a methodology to help the definition of public policies in order to minimize the

conflict of interests. A familiarity of the judges with the place of the research applied is considered significant explanatory variable in term of investigating further the usefulness and application of *Social Judgment Theory* (SJT).

The participation of inhabitants indicates that somehow they are concerned about the problems existing in their districts. This fact is important, so that future projects can be based on that information and their opinion. However, due the lack of studies concerning the present study (quality of life and transportation) and mainly due to the importance of this study for the sustainable development for a region, it is hoped that this study is a reference for future researches.

5. ABOUT THE AUTHOR

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FOOTNOTE

This article will be submitted the 10th International Conference on Mobility and Transport for Elderly and Disabled People – TRANSED 2004 – Hamamatsu, Japan, 23 –26 May 2004, in the special poster presentation session.

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