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Interaction between attribute importance and user satisfaction on the promotion of public transport

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ABSTRACT. Latin American countries have common characteristics: increase in automobile use, and decrease in the interest of users for public transport by bus caused by unsustainable urban mobility. Of these, users' interest in public transport by bus has the most significant potential for sustainable transport changes. Therefore, this paper aimed to understand how the interaction between the importance and satisfaction of users to transport attributes can help promote the increase in the passengers' transport demand in medium-sized cities of developing countries. The interaction between the users' stated importance and the users' satisfaction for automobile and public transport by bus was analyzed regarding attributes of safety, comfort, transport costs, and travel time. The study was performed in the city of Barreiras, state of Bahia, Brazil. Likert scale data analysis used three approaches that set unique importance and satisfaction ratings employed on the graphic tool Importance-Performance Analysis. It was concluded that interaction between the data of importance and satisfaction is effective, reliable, and allows the comparative analysis between the transport attributes, enabling the prioritization of strategies that help the promotion of passenger transport.

Keywords: collective public transport by bus; individual private transport by automobile; importance-performance analysis; likert scale.

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Introduction

Surveys regarding quality in the transport system are employed to evaluate the importance and/or satisfaction of their users with transport attributes, aiming to increase its quality, attractiveness, and, consequently, demand (Cordera, Nogués, González-González, & Dell'Olio, 2019; Zefreh, Hussain, & Sipos, 2020). This happens because the use of transport is associated with the user perception of attributes that characterize that transport (Karón, 2017; de Oña, Estévez, & de Oña, 2020). In this regard, many countries periodically carry out studies on transport service quality with passengers to support decision making concerning the improvement of transport quality (Börjesson & Rubensson, 2019).

According to Mkpojiogu and Hashim (2016), determining the importance of an attribute of a public transport enables to classify it in terms of its notoriety concerning their other specific characteristics. Additionally, the satisfaction with that attribute reflects the user's experience with the system. Therefore, the interaction between importance and users' satisfaction regarding different attributes of public transport enables to identify and prioritize actions that will impact the improvement of the quality of this system.

Considering that premise, this paper aimed to answer the following research question: How does the understanding of the interaction between the importance of public transport attributes and the users' satisfaction can help to promote the increase in the passengers' demand for this system in medium-sized cities of developing countries? This research question is essential, for, in developing countries, mainly Latin American, there is an overload on the need for trips caused by common characteristics of those countries, such as rapid population increase and accelerated urbanization (Motta, Silva, & Santos, 2013).

In this context, considering the growing use of automobiles by the urban population in Latin American countries, this study highlights the public transport (PT) system. Even though being the primary transport mode used in urban trips, the PT has had reduced travel demand (Pojani & Stead, 2015). In Brazil, for instance, 52.7% trips by PT are by bus, the most used vehicle by the population (45.7%), followed by automobile (22.2%; *Confederação Nacional dos Transportes* [CNT], 2017).

However, between 2018 and 2019, the Brazilian bus system lost twelve million equivalent passengers per month, while the intensity of automobile use by the urban population is growing (*Associação Nacional das Empresas de Transportes Urbanos* [NTU], 2019). This scenery accelerates the vicious circle of unsustainable urban mobility, evidenced by the severity of problems caused by transport, such as pollution, traffic jams, accidents, and climate change.

Pojani and Stead (2015) emphasized that the highest potential for sustainable changes lies in medium-sized cities compared to megacities. In this context, analysis of the transportation quality with users of the most adopted systems (bus and automobiles) in Latin America medium-sized cities becomes a relevant theme for urban sustainable mobility planning.

Nevertheless, there is a shortage of studies focusing on interaction importance and users' satisfaction concerning transport attributes in medium-sized cities. There are analyses in megacities in Latin America (Hagen, Pardo, & Valente, 2016; Barcelos, Lindau, Pereira, Danilevicz, & Caten, 2017), Sweden (Börjesson & Rubensson, 2019), Africa and Asia (Sohail, Maunder, & Miles, 2004), Latin America and Asia (Willoughby, 2013), Greece (Efthymiou & Antoniou, 2017), and Europe (Zefreh et al., 2020; de Oña et al., 2020). However, the comprehension of the interaction between importance and satisfaction in transport quality survey in Latin American medium-sized cities is still unknown.

Therefore, in addition to the aim of reducing this gap in the literature, the main contribution of this study is to identify strategies to promote the increase in the passengers' demand for PT by bus. To achieve these objectives, this study explored procedures to understand the users' stated importance and the user's satisfaction for buses and automobiles in transport quality survey in a Latin American medium-sized city. The methodological approach proposed here enables its use in other medium-sized cities.

Material and methods

The main analyses carried out in this study are summarized in the flowchart in Figure 1. The stated importance and satisfaction ratings, assigned to safety, comfort, travel time and cost by the automobile and bus users were obtained through the application of surveys. Afterward, two analyses were carried out using these data: statistical analysis by the Mann-Whitney test and the interaction analysis between the attributes' importance and the users' satisfaction employing the 'Importance-Performance Analysis' (IPA).

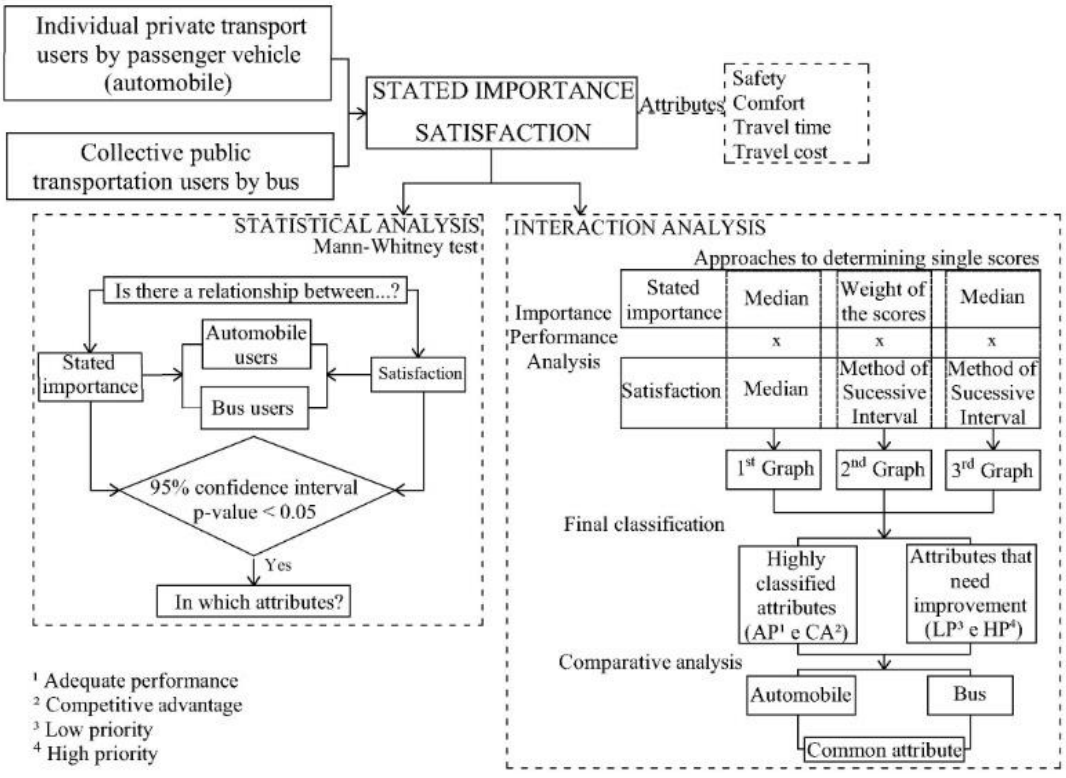


Figure 1. Flowchart of the main analysis methods employed in this research.

Employed methodology

A survey composed of three modules was adopted to gather information regarding attributes associated with the primary transport mode used for daily activities, according to the following description:

- 'Socioeconomic profile': composed of questions characterizing the respondents according to their social and economic aspects, such as gender, age, education, monthly family income, and the primary transport mode used;
- 'Stated importance': respondents of the survey determined the stated importance based on the ordering of the four attributes regarding the primary transport mode used (automobile or bus);
- 'Satisfaction': respondents informed their satisfaction regarding the four attributes indicated in Table 1 concerning the primary transport mode used (automobile or bus). In this module, a five-point Likert scale, ranging from 1 (Very unsatisfied) to 5 (Very satisfied) was considered.

The modules 'Stated importance' and 'Satisfaction' were relative to attributes associated with the trip made using the transport modes in this study (automobile or bus). Therefore, common attributes were determined for both transport modes. However, it is worth highlighting that the definition and the characteristics of those attributes can vary with the transport mode used, as listed in Table 1.

An online questionnaire was available from July 10th to August 20th, 2018, for data collection of the socioeconomic profile and the stated importance of the urban mobility criteria. The estimation of the minimum sample considered: i) sample error (ε) of approximately 5.6%; ii) standardized normal variable ($z_{\alpha/2}$) associated with a 95% confidence level equals to 1.96; and iii) populational proportion equals to 50%.

The Cronbach's alpha (α), introduced by Lee J. Cronbach, in 1951, was used to estimate the confidence of the questionnaire's responses. For this study, suggestions from Malhotra (2001) were adopted for confidence classification based on the calculation of the Cronbach's alpha, as follows: very low ($\alpha < 0.30$), low ($0.30 < \alpha < 0.60$), moderate ($0.60 < \alpha < 0.75$), high ($0.75 < \alpha > 0.90$), and very high ($0.90 \leqslant \alpha$). It is worth highlighting that α was calculated only for satisfaction, since for each respondent, the sum of the importance ratings, which is an ordered classification, will always be 10. It results in a composite variance equals to zero and consequently prevents the calculation of α.

Analyses

The 'Socioeconomic Profile' module led to the knowledge of the surveyed sample, as well as enabled both the social (gender, age, and education) and the economic (income) stratifications, from the perspective of transport modes (automobile and bus).

The 'Satisfaction' module delivered, for each respondent, a satisfaction score from 1 to 5 for every attribute. The median value of the scores assigned for every respondent of each transport and the value obtained from the Method of Sucessive Interval (MSI) was used to find a single score for each quality factor (attribute).

Table 1. Attribute characteristics for automobile and bus transport modes.

Attributes	Automobile	Bus
Safety	- Safety concerning accidents with the vehicle.	- Safety concerning accidents, accidents with vehicle, accidents in vehicle; - Public safety against thefts and steals along the way from the origin to destination, at boarding and disembarkation stations, and inside the buses.
Comfort	- Environmental conditions during the trip (temperature), noise level, travelling in a seat or not, number of connections between vehicles or transport modes, taking the trip for different purposes, and aesthetic aspects.	- It can be related to bus stops, bus stations and to the bus itself; - Aspects that include this feature are light, weather protection (cold, rain, sun), vehicle cleanliness and conservation, number of people, which considers occupancy at circulation area, seat suitability and availability. - Environmental conditions during the trip (temperature), vehicle movement (sudden variations in acceleration and deacceleration); - Taking the trip for different purposes.
Travel cost	- Cost of automobile, insurance, maintenance; - Parking fee or circulation fee, such as tolls.	- Bus ticket fare.
Travel time	- Travel time in the vehicle.	- Total time spent from origin to destination, considering: i) time spent from origin to boarding station; ii) waiting time at the boarding station; iii) time spent on connections; iv) travel time in the vehicle; and v) time spent from the disembarking station to the final destination.

By administering the questionnaires, an order from the 1st to the 4th most important attribute was identified for each respondent. Based on that order, each attribute received a weight, defined by the inverse of its position, according to Table 2. Based on those weights, the arithmetic mean was calculated considering all respondents of each transport mode (automobile and bus). The attributes were ordered by importance based on those scores. The median of importance scores was also used for the analysis. In that case, there was an inversion of the scores, so that the highest scored attribute was the most important.

The Mann-Whitney test was applied to analyze the differences in the stated importance and the satisfaction between automobile and bus users. A p-value < 0.05 was adopted for statistical significance.

Stated importance versus satisfaction grid analysis

After the interaction between the stated importance and satisfaction ratings, it was necessary to identify which attributes should be prioritized and required urgent improvement. The interaction came about by plotting those scores in the IPA grid, in which the horizontal axis is the stated importance, and the vertical axis is the satisfaction (Ho, Wen, Chu, Wu, & Wang, 2014). The grid is interpreted throughout the quadrants as follows:

- High priority attributes correspond to those extremely important and little satisfactory to the users. Improvement efforts should concentrate on these attributes;
- Low priority attributes are those with low importance and low satisfaction;
- Adequate performance attributes correspond to those extremely important and satisfactory;
- Competitive advantage attributes are those with slight importance and excellent satisfaction.

Considering that obtaining a single stated importance and satisfaction rating can be determined by different approaches, three types of graphs were constructed to classify attributes of each transport mode and further comparative analysis:

- The first graph: scores of the stated importance and attribute satisfaction used median values. The line dividing the importance area in the grid was in the median value of the scores. The line dividing the satisfaction quadrants in the grid was on score 3, i.e., scores above 3 represent satisfaction, and the scores below 3, dissatisfaction;
- The second graph: the attributes' weights defined the stated importance rating; the employment of the MSI defined the satisfaction rating; the median ratings defined the stated importance and satisfaction division axes.
- The third graph: used the median of the stated importance scores. The satisfaction score values were obtained by applying MSI, and the median defined the dividing axes of stated importance and satisfaction.

Based on the analysis of the three types of graphs, it was possible to check for the influence of the different methods to determine the stated importance and satisfaction ratings and the quadrant division axes on the attributes' classification. Following this analysis, the attributes of each transport mode were classified as Low Priority (LP), High Priority (HP), Adequate Performance (AP), and Competitive Advantage (CA).

Considering the classification, it was determined, for each transport mode, the highly scored attributes (AP and CA), and the ones that need improvement (LP and HP). Consequently, the classification allowed the identification of attributes that should be improved in the collective transport (bus) in order to: i) keep their users; and ii) draw automobile users (attributes that need automobile improvement). In addition, it was possible to identify the attribute that needs improvement on the bus mode, and has a good rating on the automobile mode, which allows an adaptation of the best automobile practices and their further application to the bus transport.

Study area

Barreiras, with an estimated population of 153,831 inhabitants, the most populous city of western state of Bahia, Northeastern Brazil (*Instituto Brasileiro de Geografia e Estatística* [IBGE], 2018), was chosen to apply the method proposed in this research (Figure 2).

Table 2. Weights of the importance scores.

Importance position	Weight
1st Attribute	1.00
2nd Attribute	0.50
3rd Attribute	0.33
4th Attribute	0.25

The city is an important road junction among North, Northeast and Center-West regions of Brazil, likely tending to expansion due to its economic potential. Further, Barreiras is among the fifteen largest grain producers in Brazil (*Superintendência de Estudos Econômicos e Sociais da Bahia* [SEI], 2017), and therefore plays a key role in the Brazilian agribusiness and, consequently, in the national economy. In ten years (2008 to 2018), the city increased its motorized vehicle fleet by 255%, in which touring vehicles and motorcycles accounted for 250 and 270%, respectively (*Departamento Nacional de Trânsito* [Denatran], 2018).

The sample obtained by an online survey comprised 314 residents from Barreiras. However, since the analysis of this study is based on the modes of individual private transport by passenger vehicle (automobile) and collective public transport by bus, only 248 individuals are considered for the sample. Among the respondents, 170 (69%) use the automobile, and 78 (31%) use the bus.

Results and discussion

Statistical analysis

Socioeconomic profile

Table 3 lists the socioeconomic features of this sample.

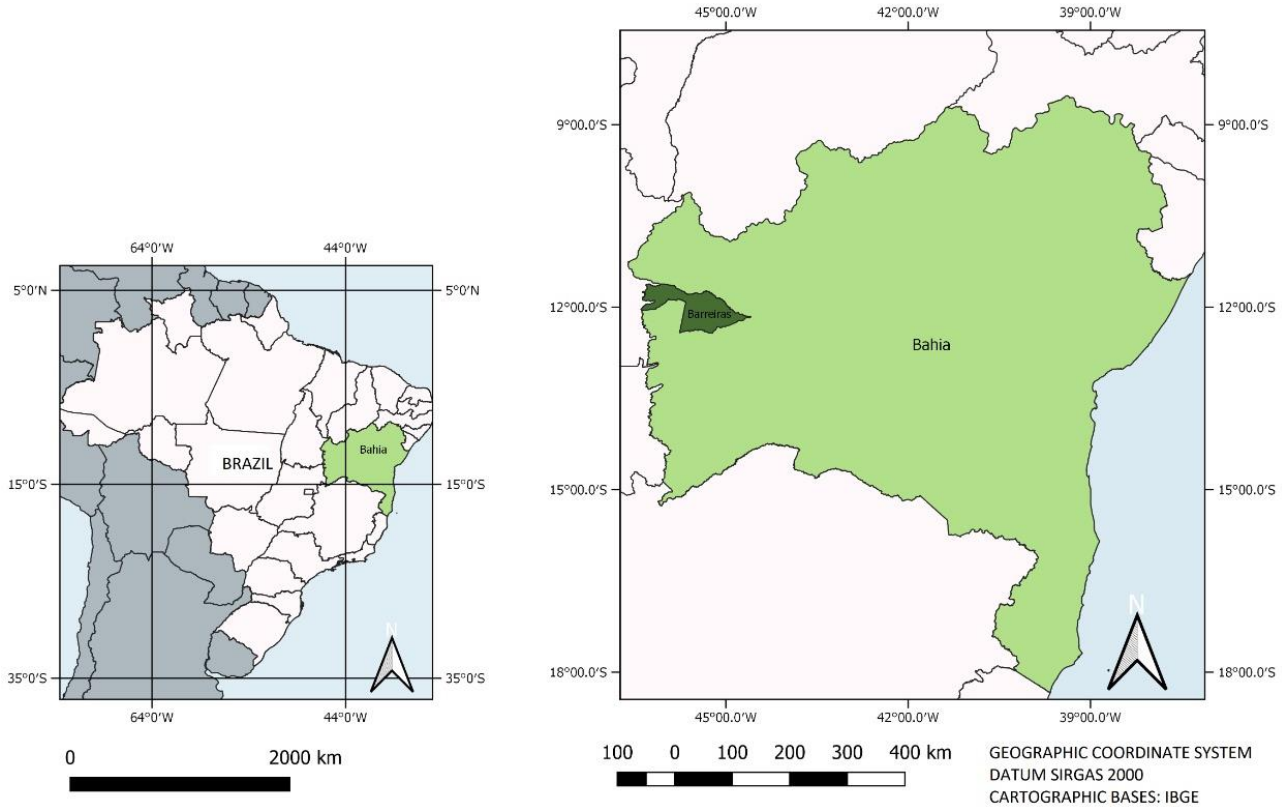


Figure 2. Barreiras location in the state of Bahia, Brazil.

Table 3. Socioeconomic features of the respondent sample.

Variables	Automobile	Bus
Gender		
Female	83 (61.94%)	51 (38.06%)
Male	87 (76.32%)	27 (23.68%)
Age (years)	30.6 ± 10.3	30.8 ± 10.4
Education		
≤ Undergraduate	71 (51.82%)	66 (48.18%)
Graduate	99 (89.19%)	12 (10.81%)
Monthly Family income		
< 3 minimum wages	12 (23.08%)	40 (76.92%)
≥ 3 minimum wages	158 (80.61%)	38 (19.39%)

It can be observed, from Table 3, the bus users' socioeconomic profile, comprised mostly of people with no college education and monthly family income under 3 minimum wages. Therefore, it is highlighted the importance of meeting these people needs and analyze the modal choice criteria of people with college education, male and female gender and from different ages, in order to keep the current users and attract new public transport users.

The Cronbach coefficients for satisfaction assigned by users to mobility attributes related to the bus (0.77) and the automobile (0.66) modes showed that the confidence levels were high and moderate, respectively. Thus, the internal consistency of satisfaction responses to the mobility attributes revealed that the employed online questionnaire is a reliable instrument.

Stated importance and satisfaction

Figure 3 illustrates the relative frequency of satisfaction for the safety, comfort, travel cost, and time attributes assigned by the sample of automobile and bus users. There were more satisfied automobile users with safety, comfort, and travel time than those using the bus as their primary mode of transport. On both modes of transport, users showed higher dissatisfaction with the cost of travel, in which the higher dissatisfied percentage corresponded to bus users. Among automobile users, comfort showed a higher relative frequency of satisfaction, whereas, among bus users, there were more satisfied passengers with travel time.

Figure 4 illustrates the relative frequency of the stated importance, assigned by the sample of automobile and bus users.

Regardless of the transport mode, safety was classified as the most important. There was a discrepancy in the importance of comfort and travel time between the bus and automobile users since the automobile users consider them the most important. A higher percentage of bus users classified travel cost as the most important compared to automobile users.

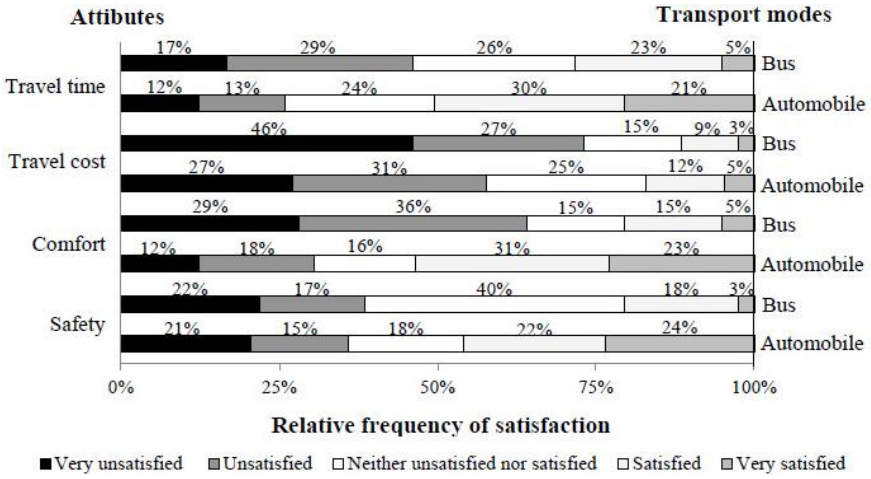


Figure 3. Relative frequency regarding satisfaction to the mobility attributes by automobile and bus users.

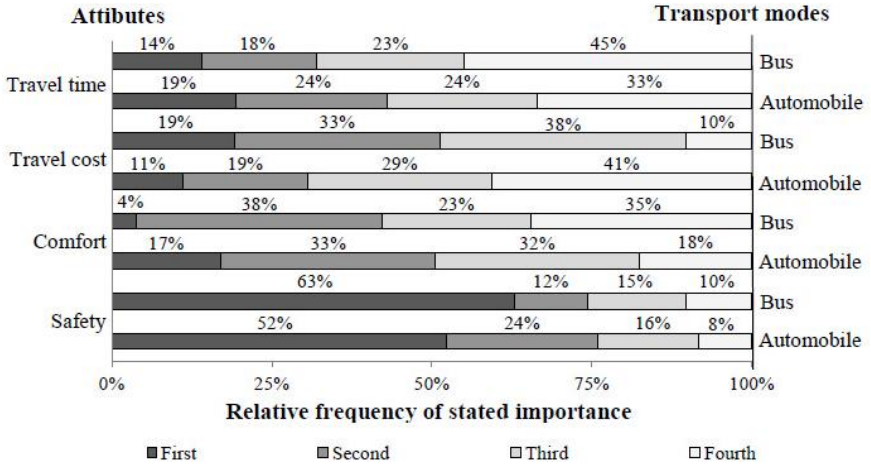


Figure 4. Relative frequency of stated importance assigned to the mobility attributes by automobile and bus users.

Interaction analysis

Stated importance of the attributes

Figure 5 shows a Box-Plot with stated importance scores assigned by the automobile and bus users to the mobility attributes.

Figure 5 reveals that users of both transport modes showed the same importance measure for the safety and travel time attributes, with medians equal to 4 (first most important) and 2 (third most important), respectively. Therefore, comfort and travel cost are the attributes distinguishing users of both transport modes concerning the assigned stated importance.

The comfort attribute was more important among automobile users, 3 (second most important), compared to bus users, 2 (third most important). The travel cost attribute was more important among bus users, 3 (second most important), compared to automobile users, 2 (third most important). In this case, there was an inversion of what is considered as necessary among users of these transport modes. For bus users, the priority is the travel cost attribute, whereas automobile users prioritize the comfort attribute.

Figure 5 also shows the attributes with the largest dispersions regarding the importance scores assigned by the automobile and bus users, which evidence a more significant variability among their users' opinions. For the comfort and safety attributes, the highest variability of opinions was among bus users, whereas for the travel cost attribute, the highest variability was found among automobile users. Thus, based only on the stated importance analysis, it is necessary to invest in safety and comfort to attract automobile users to the bus transport mode. Similarly, to keep the bus users, it is necessary to design public policies that would cause the bus travel costs to drop.

Table 4 lists the mean weights and the order of importance for mobility attributes according to bus and automobile users.

The order of attributes' importance in Table 4 reveals that regardless of the approach used to determine single scores for importance, median, and scores weight, the classification of the attributes' importance was the same.

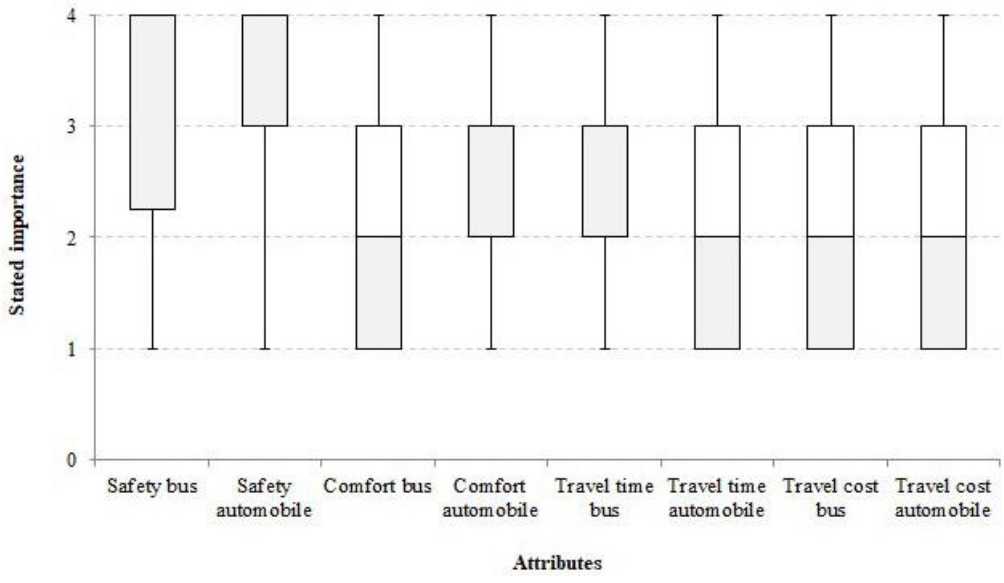


Figure 5. Box-Plot for the stated importance assigned by the automobile and bus users to the mobility attributes.

Table 4. Attribute order according to the stated importance assigned by the automobile and bus users regarding mobility attributes.

Attributes	Automobile		Bus	
	Mean weights (0 – 1)	Order	Mean weights (0 – 1)	Order
Safety	0.715	1	0.763	1
Comfort	0.488	2	0.394	4
Travel cost	0.406	4	0.506	2
Travel time	0.474	3	0.412	3

Satisfaction

Figure 6 shows the satisfaction scores assigned by the automobile and bus users to the mobility attributes.

Based on Figure 6, it was possible to determine the measurement (median) of satisfaction of the mobility attributes for automobile and bus assigned by their users, and the dispersion or variability of the satisfaction scores. The safety and travel cost attributes, in both transport modes, showed the same measurement of satisfaction, with medians equal to 3 (neither unsatisfied nor satisfied), and 2 (unsatisfied), respectively. No attribute, in the automobile or on the bus, was scored with a 5 for satisfaction (very satisfied), by at least 75% of the sampling population. Such fact highlights that, regardless of the transport mode, most of the automobile and bus users were not very satisfied with the quality of the trips.

In addition, the satisfaction assigned to safety by bus users, and the one assigned to comfort and travel time, by automobile users, showed low dispersion, revealing a consensus in the ratings assigned by the users of those transport modes. Satisfaction of automobile users is higher than that of bus users regarding comfort and travel time. Only automobile users showed satisfaction for comfort and travel time, with median equals to 4 (satisfied). This highlights the need for improvement in the bus trip quality.

Table 5 shows the mean scores obtained by the MSI of automobile and bus users' satisfaction with the analyzed attributes. Based on the mean scores, it was possible to perform a normalization between 0 and 1. Automobile users were more satisfied with comfort and travel time, and bus users were more satisfied with travel time. Travel cost had the lowest satisfaction for users of both transport modes.

It is possible to infer that the analysis of automobile and bus users' satisfaction concerning mobility attributes was similar, regardless of the used approach, median, or MSI, to determine single satisfaction scores. This is discussed below.

Statistical analysis of stated importance and satisfaction ratings

Table 6 shows the correlations between stated importance to the analyzed attributes by the automobile and bus users and the satisfaction of these users.

The comparison between automobile and bus users regarding the stated importance showed a correlation between comfort and travel cost. Automobile users assigned higher importance scores to comfort (p-value = 0.01) and lower importance scores to travel cost (p-value < 0.001) when compared to bus users, as previously observed in Figure 6. This revealed the priorities of each user. In this case, for automobile users, the comfort attribute, and for bus users, the travel cost.

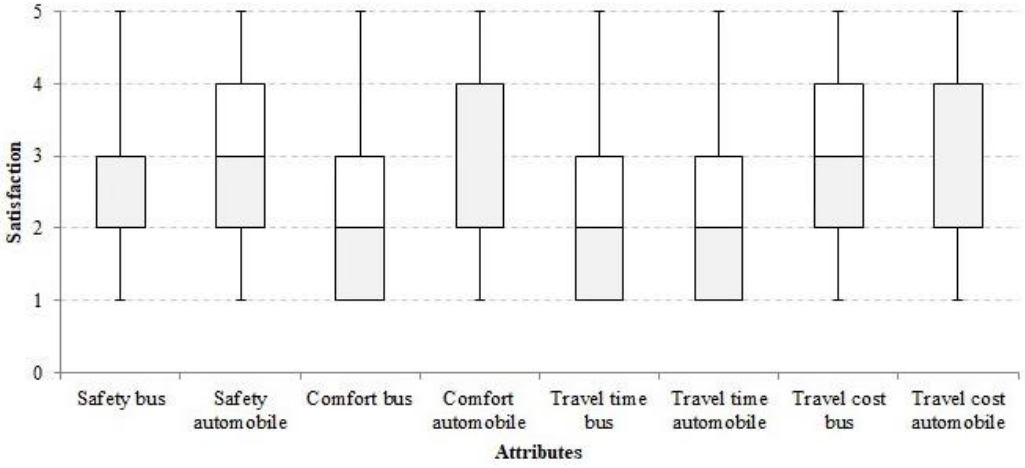


Figure 6. Box-Plot for the satisfaction assigned by the automobile and bus users to the mobility attributes.

Table 5. Automobile and bus users' satisfaction ratings regarding mobility attributes obtained by the MSI.

Attributes	Automobile		Bus	
	Mean scores	Scale 0 - 1	Mean scores	Scale 0 - 1
Safety	1.55	0.80	1.33	0.77
Comfort	1.70	1.00	1.22	0.57
Travel cost	0.98	0.00	0.90	0.00
Travel time	1.69	0.99	1.46	1.00

Table 6. Correlation between stated importance and satisfaction concerning attributes related to the mobility of automobile and bus users.

Attributes	Stated importance			Satisfaction		
	Automobile (n = 170)	Bus (n = 78)	p-value	Automobile (n = 170)	Bus (n = 78)	p-value
Safety	4.0 (2.0 – 4.0)	4.0 (3.0 – 4.0)	0.34	3.0[a] (2.0 – 4.0)	3.0 (2.0 – 3.0)	0.01*
Comfort	3.0 (2.0 – 3.0)	2.0 (1.0 – 3.0)	0.01*	4.0 (2.0 – 4.0)	2.0 (1.0 – 3.0)	< 0.001*
Travel cost	2.0 (1.0 – 3.0)	3.0 (2.0 – 3.0)	< 0.001*	2.0[a] (1.0 – 3.0)	2.0 (1.0 – 3.0)	0.004*
Travel time	2.0 (1.0 – 3.0)	2.0 (1.0 – 3.0)	0.07	4.0 (2.0 – 4.0)	3.0 (2.0 – 4.0)	< 0.001*

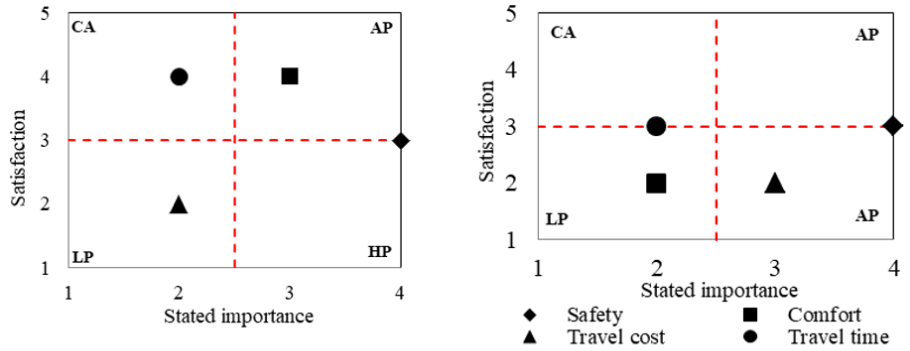
*Mann-Whitney test with adopted significance level of 5%, p-value ⩽ 0.05; [a]Greatest sum of ranks for private automobile.

As for satisfaction, automobile users were more satisfied with safety, comfort, travel cost, and travel time compared to bus users. This fact confirms the need for quality improvement of services delivered by bus in order to prevent the migration of these users to the automobile mode.

Analysis of attributes classification

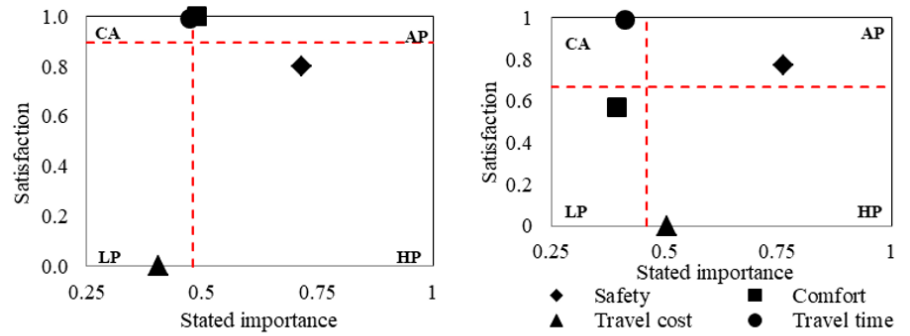
Figure 7, 8, and 9 show the IPAs. Different approaches determined a single score of the stated importance and satisfaction of the mobility attributes assigned by the automobile and bus users.

The position of the attributes on the scatterplots varied according to the approach used to obtain the respective stated importance and satisfaction ratings. Similarly, the classification areas change according to the scatterplot division grids. Among the normalized satisfaction ratings obtained by the MSI, there was always one attribute in each of the normalized edges (0 and 1). This did not interfere with the interaction analysis of importance and satisfaction data of the attributes, since the scores values are in a scalar interval, preserving the relationship or the "distance" between the scores of the studied attributes.



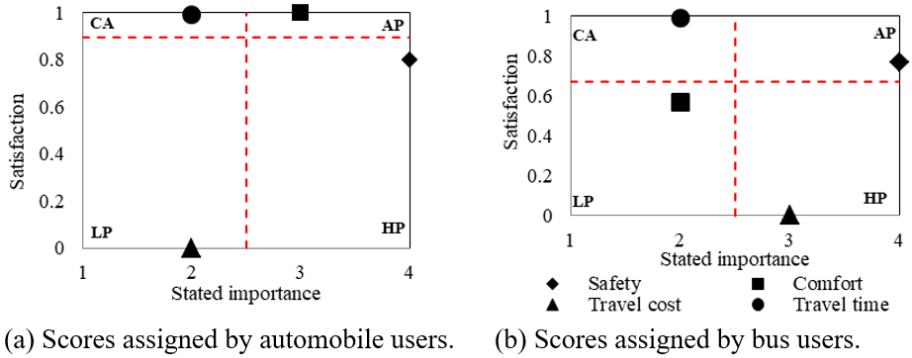
(a) Scores assigned by automobile users. (b) Scores assigned by bus users.

Figure 7. IPA with stated importance and satisfaction scores obtained by the median.



(a) Scores assigned by automobile users. (b) Scores assigned by bus users.

Figure 8. IPA with stated importance scores obtained from the mean scores assigned to the attributes and satisfaction scores obtained by the MSI.



(a) Scores assigned by automobile users. (b) Scores assigned by bus users.

Figure 9. IPA with stated importance scores obtained by the median, and satisfaction scores obtained by the MSI.

As previously highlighted, using the median or the rating obtained by the MSI when determining a single rating for the perception of automobile and bus users' perception concerning the attributes of the respective transports induces the same user satisfaction analysis regarding the automobile and bus attributes. However, as observed in Figure 7, 8, and 9, the adoption of these different approaches in determining a single score might influence the interaction analysis of these data and, consequently, the definition and prioritization of strategies to improve the passenger transport system.

For that reason, Table 7 lists the attribute classification obtained in each graph and its final classification, according to the analysis of Figure 7, 8, and 9. In this study, the attribute was classified according to the classification obtained by most graphs.

Comparative analysis

Analyses resulted in the identification of two groups of attributes according to the final classification of the automobile and bus mobility attributes (Figure 10). The first group included the bus-use related attributes that require attention from both the public power and the bus operators to keep their users. The second group contained the bus system attributes that require improvement to attract automobile users, considering those attributes with good performance on the automobile transport mode.

The following remarks can be drawn from Figure 10:

- Comfort had an adequate performance for automobile users and requires strategies to promote its improvement regarding collective motorized mode by bus, with the primary goal of keeping their current users.
- Travel cost was deficient for bus users, classified as a high priority, and for automobile users, classified as low priority. Thus, improvement strategies for bus travel costs might keep current users and attract new ones to the bus transport.
- Travel time ranked as a competitive advantage for trips made both by automobile and by bus. Hence, due to the equality in this attribute's classification in both transport modes, it requires improvement in the bus trips an alternative to compete with its performance in automobile trips.
- Safety showed adequate performance by users of collective motorized mode by bus and ranked as high priority by automobile users. Therefore, safety might be an attractive attribute of buses to automobile users.

Table 7. Classification of attributes of trips made by automobile and bus, according to the stated importance and satisfaction of their users.

Automobile attributes	Figure 7a	Figure 8a	Figure 9a	Final classification
Safety	HP/DA	HP	HP	HP
Comfort	AP	AP	AP	AP
Travel cost	LP	LP	LP	LP
Travel time	CA	CA	CA	CA
Bus attributes	**Figure 7b**	**Figure 8b**	**Figure 9b**	**Final classification**
Safety	HP/AP	AP	AP	AP
Comfort	LP	LP	LP	LP
Travel cost	HP	HP	HP	HP
Travel time	LP/CA	CA	CA	CA

HP – High priority; LP – Low priority; AP – Adequate performance; and CA – Competitive advantage.

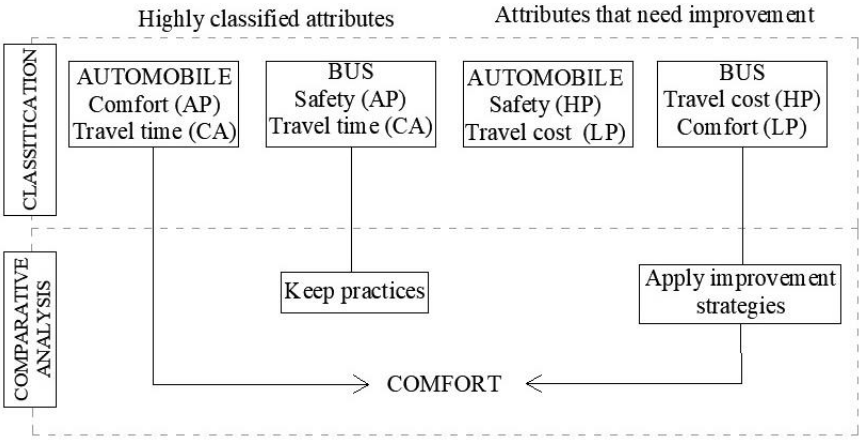


Figure 10. Comparative analysis of the classification for the automobile and bus mobility.

Barcelos et al. (2017) evaluated the collective public transportation attribute importance from the satisfaction of users in the municipality of Porto Alegre, and reported that the comfort attribute is the most important and needs improvements in the collective public transport system. Thus, their result is similar to our findings in a medium-sized city.

Conclusion

From this research, it can be concluded that:

- The use of different approaches (median, weights and MSI) to determine the unique scores of measurements obtained on a Likert scale is complementary and allows the comparison of travel attributes between automobiles and buses;

- The classification of attributes (low priority, high priority, adequate performance and competitive advantage), based on the interaction of declared importance and satisfaction (IPA), makes it possible to identify the attributes of the collective mode by buses that require improvements to keep their users and attract new ones.

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