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Satisfacción del servicio de transporte público en los estudiantes universitarios

Satisfaction with public transportation service among university students

Satisfação do serviço de transporte público em estudantes universitários

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Resumen

El objetivo de esta investigación fue estimar la satisfacción de estudiantes universitarios con respecto a los elementos de calidad de servicio del transporte público urbano del estado de Colima. El indicador de calidad del servicio se diseñó en una encuesta de percepción de 13 ítems que incorporó una serie de aspectos del servicio. El análisis factorial se aplicó a través de una regresión logística tipo *logit* que permitió identificar los constructos latentes en esta escala. Se identificaron ocho constructos asociados a la calidad percibida del servicio de autobús: horario congruente, precio accesible, personal inspira confianza, servicio cubre las necesidades, tiempo de espera, distancia del recorrido, infraestructura carretera y planeación del recorrido. Estos constructos latentes se exploraron mediante una apreciación de cómo las percepciones hacia la calidad del servicio de autobús varían a través de las cohortes de sexo y ciudad para explicar el grado en que estas percepciones son de utilidad para explicar la variación en la satisfacción percibida con dicho servicio. Los resultados del análisis sugieren que las percepciones asociadas a la calidad del servicio de autobús varían significativamente entre los distintos grupos de

pasajeros, siendo las mujeres las que tienden a mostrar un aumento de la percepción de la calidad del servicio que pagan por el TP (1.12 más veces que los hombres). Esto implica que los hombres son más exigentes que las mujeres con respecto al servicio de TP de pagan. La satisfacción en relación con el precio pagado y el servicio recibido es menor en los hombres que en las mujeres. Además, la conveniencia percibida del servicio de autobús parece tener un poder explicativo positivo significativo sobre la satisfacción percibida con el servicio de autobús, lo que sugiere que las mejoras en el horario, el precio, el personal, cubrir las necesidades, el tiempo, la distancia, la infraestructura y la planeación del recorrido probablemente aumentarán la satisfacción percibida entre los pasajeros. Como limitantes se puede señalar que los participantes de los cuales se obtuvo la percepción del servicio de transporte fueron exclusivamente estudiantes de educación media y superior. Aun así, esta investigación demostró el nivel de conocimiento adicional que puede obtenerse a través de un análisis más detallado de los datos generados sobre la política de transporte público y de los servicios ofertados a la comunidad estudiantil.

Palabras clave: análisis multivariado, estudiante universitario, servicio, transporte público.

Abstract

The objective of this research was to estimate the satisfaction of university students with respect to the service quality elements of urban public transportation in the State of Colima. The service quality indicator was designed in a 13-item perception survey that incorporated a series of service aspects. The factor analysis was applied through a logistic regression type logit allowed identifying the latent constructs that are present in this scale. Eight latent constructs associated with the perceived quality of the bus service were identified: congruent schedule, accessible price, staff inspires confidence, service meets needs, waiting time, travel distance, road infrastructure and route planning. These latent constructs were explored through an appreciation of how perceptions of bus service quality vary across sex and city cohorts to explain the degree to which these perceptions are useful in explaining variation in perceived satisfaction with bus service. The results of the analysis suggested that perceptions regarding bus service quality vary significantly across different groups of riders, with women tending to show increased perceptions of service quality paying for PT 1.12 more times than a man. This implies that men are more demanding than women with respect to the PT service they pay for. Satisfaction in relation to the price paid and the service received is lower in men than in women. In addition,

perceived convenience of bus service appears to have significant positive explanatory power on perceived satisfaction with bus service, suggesting that improvements in schedule, price, staffing, meeting needs, time, distance, infrastructure, and route planning are likely to increase perceived satisfaction among passengers.

As limitations, it was observed that the participants from whom the perception of the transportation service was obtained were exclusively middle and high school students. These results allowed us to contribute to the feedback and decision making process to improve the services offered to the student community. On a more general level, this research demonstrated the level of additional knowledge that can be gained through a more detailed analysis of the data generated on public transportation policy and services offered to the student community.

Keywords: multivariate analysis, university students, services, public transport.

Resumo

O objetivo desta pesquisa foi estimar a satisfação de estudantes universitários com relação à qualidade dos elementos de serviço do transporte público urbano no estado de Colima. O indicador de qualidade do serviço foi desenhado em uma pesquisa de percepção de 13 itens que incorporou uma série de aspectos do serviço. A análise fatorial foi aplicada por meio de uma regressão logística do tipo logit que permitiu a identificação dos construtos latentes nessa escala. Oito construtos associados à qualidade percebida do serviço de ônibus foram identificados: cronograma consistente, preço acessível, equipe que inspira confiança, serviço atende às necessidades, tempo de espera, distância da viagem, infraestrutura rodoviária e planejamento de rotas. Esses construtos latentes foram explorados por meio de uma apreciação de como as percepções em relação à qualidade do serviço de ônibus variam entre os grupos de sexo e cidade para explicar o grau em que essas percepções são úteis para explicar a variação na satisfação percebida com o referido serviço de ônibus. Os resultados da análise sugerem que as percepções associadas à qualidade do serviço de autocarro variam significativamente entre os diferentes grupos de passageiros, sendo as mulheres que tendem a apresentar um aumento na percepção da qualidade do serviço que pagam pelo PT (1,12 mais vezes do que os homens). Isto implica que os homens são mais exigentes do que as mulheres no que diz respeito ao serviço de PT pago. A satisfação em relação ao preço pago e ao serviço recebido é menor nos homens do que nas mulheres. Além disso, a conveniência percebida do serviço de ônibus parece ter um poder explicativo positivo significativo sobre a satisfação percebida com o serviço de ônibus,

sugerindo que as melhorias no horário, preço, pessoal, necessidades de atendimento, tempo, distância, infraestrutura e planejamento de rotas provavelmente aumentarão satisfação percebida entre os passageiros. Como limitações, pode-se notar que os participantes dos quais se obteve a percepção do serviço de transporte eram exclusivamente estudantes do ensino médio e superior. Mesmo assim, esta pesquisa demonstrou o nível de conhecimento adicional que pode ser obtido por meio de uma análise mais detalhada dos dados gerados sobre a política de transporte público e os serviços oferecidos à comunidade estudantil.

Palavras-chave: análise multivariada, estudante universitário, serviço, transporte público.

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Introduction

In the context of service companies, satisfaction can be quantified by the user's perception of the service itself. However, this qualification is only a tangible element of a cluster of factors mainly linked to the structure of the system at its technical, functional and perception levels (Duque and Gómez, 2015).

Therefore, the establishment of collective transport objectives (technical level) and the way to operate, regulate and concession the service (functional level) are determining factors in the perception of the performance of the system. In this way, to evaluate the satisfaction of the service it is necessary to measure it in a comprehensive way, since it affects at least two aspects: the choice and competition of the collective transport service.

The first aspect refers to the choice of users to use the available means of public transport. This - in a context where price, times and distances are decision factors - service satisfaction is more likely to be the decisive factor for the mode of transport (Subramaniana, Gunasekaran, Yu, Cheng & Ning, 2014).

In the case of Mexico —as in the rest of Latin America— the provision of public transport services is concessioned to private initiative, for which reason several types of collective or individual transport services offer the same route. This generates competition between public transport concessionaires, since the offer is divided into several options, that is, taxis belonging to one owner, buses from another company, etc., which forces the development of strategies to attract the greatest number of users (Sánchez-Flores and Romero-Torres, 2010).

For this reason, evaluating service satisfaction is essential and complicated. In practice, quantitative methodologies are usually designed to measure the performance of public transport (Rodríguez and Díaz, 2014). In other cases, new perspectives are evaluated to model the travel

behavior of users and related satisfaction measures (Cascetta and Cartení, 2011). Finally, and in the best of cases, the assessment of various agents (Callejas-Cuervo, Valero-Bustos and Alarcón-Aldana, 2014) is integrated, leaving aside the intangible and individual factors of the users.

From the application of discrete choice experiments, results are obtained on the different types of decisions - such as non-linear preferences - and their relationship with public transport services is established (Román, Martín and Espino, 2014; Sottile, Di Teulada , Meloni and Cherchi, 2018; Stathopoulos and Marcucci, 2014).

The investigations used by these discrete choice models seek not only to estimate the effect of users' perception on the proportion of use of a means of transport, but also the serial correlation between the error terms in the discrete and latent perceptions for allow agent common unknown factors.

In this way, the choice models are based on the fact that a user must decide between a certain number of options. These show how microeconomics can be used to explain everyday situations where individuals face decisions. This is equivalent to saying that from a catalog of options the user orders them according to their consumption possibilities, classifying them from the least to the most preferable, which constitutes a utility function (Varian, 1982).

While models of choice continue to be developed and empirically tested, different approaches lead to similar results. Therefore, considering the multiple investigations (Aparicio, Ramírez and Gómez, 2013; Becerra, Serna and Naranjo, 2013; Guercio, Martínez and Vigier, 2017; Torres, 2011), we can affirm that discrete choice models describe decision behavior rightly.

Having explained the above, in this research we sought to reflect on what are the factors that affect the satisfaction of public transport in Colima. To do this, a choice model was applied in the context of urban public transport services in order to estimate the factors that intervene in the perception of user satisfaction. For this, a discrete choice model was applied with its corresponding identification, weighting and valuation techniques. The results obtained provide information consistent with the coverage of the service, the pleasantness of the stay, the treatment and attention of the staff and the sufficient and adequate space.

Development

In the academic literature, three types of theoretical perspectives can be identified that distinguish the factors related to the satisfaction of the service in public transport: the measurement of the performance of the service, the evaluation of the user through surveys and the econometrics of discrete choice with a utility function.

The first perspective is based on the evaluation of the performance of the level of service (Rodríguez and Díaz, 2014) offered by a certain factor. Such performance is determined from the perspective of some actors, such as operators and users, in such a way that each actor defines and weighs the factors perceived as important. In the case of Latin America (Aparicio, Ramírez & Gómez, 2013; Rodríguez & Díaz, 2014), some studies have defined various factors integrated in turn of multiple criteria, such as waiting time, travel time, travel distance, space of the units, driving safety, environmental impact, planning and coverage of the routes, among others.

The second perspective is based on the assessment through surveys of user satisfaction and the identification of quality gaps between expectations and the services offered. In this perspective, the service satisfaction indicator was based on the one used by the Scottish government for the motor transport sector, which uses 11 factors to measure the quality of service: travel time; frequency; adjust to needs; stable service without regular changes; cleaning; comfort; security; ease of choosing the type of ticket; knowledge of routes and schedules; ease of changing routes and other transport, and value of fares (Morton, Caulfield and Anable, 2016).

The last perspective uses the microeconomic theory of the consumer to create, from the specification of a discrete choice model, where an integrated utility function was experimented with to estimate the preferences of travelers and obtain a general measure of service satisfaction. (Román et al., 2014). The estimates obtained show the weighting of each of the defined factors, which makes economic valuation possible (Stathopoulos and Marcucci, 2014). The analysis of the service satisfaction factors carried out throughout this article is limited to this last perspective.

The problem of public transport of the urban collective type in the four municipalities with the largest population in the state of Colima (Tecomán, Manzanillo and the Colima-Villa de Álvarez metropolitan area) can be measured in a series of factors with almost identical characteristics between them. The economic-social problem of urban transport in this entity does not lie in the rate, but in various factors such as time, distance, coverage, quality and operability.

Regarding the time-distance factor, traveling an average distance of 6 kilometers takes approximately 55 minutes, without considering the waiting time for not meeting the demand for

the service at peak times. In terms of coverage, the more the service is required by the student body, the less availability exists to reach the study campuses on time.

Regarding the quality factor, there is an exaggerated physical wear on the exterior and interior of the trucks that are currently in operation, without taking into account that in the Law of Sustainable Mobility of the state of Colima (LMSEC), in its article 201, establishes that the buses of the urban corridor service must not exceed 10 years old, extendable up to 5 years (most exceed 12 years) (Official Gazette of the State of Colima [POEC], 2017).

The operation, related to the personnel in charge of handling the trucks, is attributed the decision-making power to grant the discount and - in a large number of cases - the service to the students without any reason.

On the other hand, the underlying problems that paralyze the proper functioning of this public service are administrative deficiencies, since there is no strict control over the requirements to grant a concession to those who really need it; This means that the selected criteria are decided regularly in a discretionary, unipersonal and unilateral manner by the authorities with decision-making power.

Second, by facilitating the means for the operation of the service through corruption or legal evasion of requirements, with a low demand for professionalization of the service and little training for drivers, there is no defined process. The control mechanisms regarding the way and times in which the routes operate allow the sections to be able to work in an autocratic manner.

The routes are drawn based on purely economic calculations, when the logic of the service says that they should be established according to the demand of the users to benefit an important sector of the population. However, since this is not the case, urban trucks travel long distances to offer the service, for which the user is forced to travel to the collection point closest to his home.

For all the above, the need arises to analyze the quality indicators in urban public transport so that it can be considered as a mobility option that meets the new challenges of demand, coverage and sufficiency established by social dynamics.

That said, the identification of determining factors of satisfaction with the public transport service in the study corridor was carried out in two moments: 1) literature review and 2) design of a survey to assess the mentioned variables.

From the literature review, an inventory of factors was obtained based on the contributions of Morton et al. (2016) and Backhoff and Vázquez (2002). Thus, 13 criteria were

considered: service, stay, personnel, space, units, time, distance, schedule, price, personnel, infrastructure, planning and management.

Methodology

Once the literature had been reviewed, the constructs of the quality of the PT service were determined, from which a survey of 13 items was designed as indicators of service quality to know the experiences perceived by the clients of the state of Colima. This indicator was measured using a five-point Likert-type scale that ranges from strongly disagree to strongly agree. In this survey, bus users were asked to indicate the degree of agreement with each of the statements offered. The indicators are detailed in Table 1, where the statements of opinion and a series of descriptive statistics related to the responses to these statements are indicated.

Tabla 1. Descripción de los constructos y los ítems del instrumento aplicado

Constructos	Ítem
Variable dependiente:	
Satisfacción del servicio	Usaría más el transporte público.
Variables independientes	
Horario	El horario de las rutas es congruente a sus necesidades.
Precio	El precio resulta accesible.
Confianza del personal	El personal inspira confianza.
Servicio	El servicio cubre todas sus necesidades.
Estancia	La estancia en la unidad es grata.
Atención del personal	El personal atiende siempre sus señales de parada.
Espacio	El espacio de las unidades es suficiente y adecuado.
Unidades	Las unidades se encuentran en buen estado.
Tiempo	El tiempo de espera es el adecuado para usted.
Distancia	La distancia de recorrido es la apropiada para usted.
Infraestructura	La infraestructura de las calles está en buenas condiciones.
Planeación	La planeación de recorrido de rutas les permite acceso a todas las colonias.
Riesgo	La rapidez del manejo de la unidad no pone en riesgo al pasajero.

Fuente: Elaboración propia

The sample was determined in 456 students of upper secondary and higher education, who were users of public transport. The designed survey was applied to them, proportionally distributing the number of surveys in the four main cities of the state of Colima: Colima-Villa

de Álvarez (as this is a conurbation, the information was organized as a single city); Tecomán and Manzanillo. Table 2 shows this distribution of percentages of the sample.

Tabla 2. Características de la muestra

Ciudad	#	%	Sexo	#	%
Colima y VA	197	43	Hombre	224	49
Tecomán	100	22	Mujer	232	51
Manzanillo	159	35			
Total	456	100	Total		100

Fuente: Elaboración propia

The survey was self-made and internal consistency was validated with Cronbach's alpha technique, in which a score of 0.81 was obtained, which represents a very good internal consistency (Oviedo and Campo-Arias, 2005; Soler and Soler , 2012).

For the factorial analysis, statistical techniques were applied to adjust the discrete choice models to identify, weight and assess the factors that determine the choice of satisfaction with a public transport service. In this regard, it was necessary to specify the utility function to be estimated in order to determine its significance, obtain its relative weight, as well as the availability to pay for a possible modification. In this sense, and considering that the methodological design included only two alternatives, binary logit random utility models were adjusted, whose specification of the function has the form $U_n = V_n + \mathcal{E}$.

In econometric terms, V_n represents the systematic, quantifiable and perceived part of the utility; while $\mathcal{E}$ it constitutes the random error that is interpreted as the part of the utility that the modeler cannot measure (Narayan, Cats, van Oort and Hoogendoorn, 2020). The component V_n specified based on quantifiable characteristics X_n, that have a weight β_n^n.

For this research V_n It is made up of schedule, price, staff trust, service, stay, staff attention, space, units, time, distance, infrastructure, planning, and risk. Its mathematical representation is shown in equation 1:

$$V_i = \beta_0 + \beta_1\, horario + \beta_2\, precio + \beta_3\, confianza\ del\ pesonal + \beta_4\, servicio + \beta_5\, estancia + \beta_6\, atención\ del\ personal + \beta_7\, espacio + \beta_8\, unidades + \beta_9\, tiempo + \beta_{10}\, distancia + \beta_{11}\, infraestructura + \beta_{12}\, planeación + \beta_{13}\, riesgo \quad \textit{(ecuación 1)}$$

The above equation represents the utility (satisfaction) perceived by the user in choosing under which conditions to use public transport the most. Factors linked to the level of service

were treated as continuous variables, while sex, city and occupation were considered as categorical variables.

Parameters β_i arise from the econometric adjustment of the maximum likelihood ratio. Be part of the existence of a specific constant β_0, which is the increased use of mass transit as an improved alternative. This is due to the fact that the surveys place the user in a hypothetical choice in which the use of the TP service would increase.

This constant allows capturing, on the one hand, the set of service improvements not observable by the respondent, but which lead him to imagine a service alternative; on the other hand, the satisfaction gaps between the expectations of the service and its actual conditions, which allows those responsible for the public service to take action on the matter for its improvement.

Results

Following the exploratory analysis technique, Table 3 shows the correlation of the 13 identified service quality indicators.

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Tabla 3. Correlación de los factores del servicio de transporte público

	Utilidad	Hora	Precio	Personal	Servicio	Estancia	Personal	Espacio	Unidades	Tiempo	Distancia	Infraestructura	Planeación	Riesgo
Utilidad	1.000													
Horario congruente	.4539*	1.000												
Precio accesible	.5350*	.4935*	1.000											
Personal inspira confianza	.4024*	.4458*	.5042*	1.000										
Servicio cubre necesidad	.4395*	.4974*	.4831*	.6419*	1.000									
Estancia agradable	.4431*	.4193*	.4395*	.6204*	.6546*	1.000								
Personal atiende	.4033*	.4134*	.4048*	.4987*	.5196*	.5444*	1.000							
Espacio suficiente	.3728*	.4330*	.4104*	.4842*	.5229*	.5926*	.5706*	1.000						
Unidades en buen estado	.5819*	.3830*	.3728*	.4976*	.4603*	.5261*	.4685*	.5819*	1.000					
Tiempo de espera	.4742	.5129*	.3673*	.4854*	.4727*	.4106*	.4286*	.5059*	.5649*	1.000				
Distancia del recorrido	.5229*	.3982*	.4836*	.4948*	.5228*	.4688*	.4746*	.4303*	.5284*	.6313*	1.000			
Infraestructura carretera	.5374*	.3608*	.4342*	.4938*	.4279*	.4813*	.4663*	.5053*	.5114*	.5406*	.5677*	1.000		
Planeación del recorrido	.5550*	.4472*	.4930*	.5440*	.4649*	.4320*	.4301*	.4347*	.4742*	.5229*	.5374*	.5550*	1.000	

Riesgo del manejo	.5440*	.3827*	.4083*	.5122*	.4343*	.5137*	.4676*	.4595*	.4065*	.4278*	.4501*	.5429*	.5035*	1.000

Nota: Significancia al (*) 1 %
Fuente: Elaboración propia con base en STATA 14

In this way, these indicators were used to run the analyzes on declared preferences (PD) based on a logistic design.

In the case of this research, we sought to estimate the probability that users perceive satisfaction with one or another element of the quality of public transport service, given the characteristics of sex and city.

For the confirmatory analysis, a bilogit logistic regression was applied, which is shown in Table 4. These analyzes are framed in non-linear models, which allow knowing the positive (ascending) or negative (descending) trend of a probability of occurrence of a stated behavior or preference (Cascetta y Cartenì, 2011).

Tabla 4. Regresión *bilogit* de la satisfacción del servicio

Factores	Coeficientes	*P*-valor	Razón de probabilidad
Horario congruente	0.530	0.005 *	1.700
El precio resulta accesible	0.615	0.000 *	2.098
Personal inspira confianza	0.441	0.001*	1.406
Servicio cubre las necesidades	0.224	0.029**	1.251
Tiempo de espera	-0.353	0.001*	0.702
Distancia del recorrido	-0.374	0.000*	0.454
Infraestructura carretera	0.212	0.024**	1.236
Planeación del recorrido	0.289	0.002*	1.335
Número de observaciones	456		
	Chi-cuadrado	R-cuadrado	
Razón de verosimilitud	0.0000	0.1760	

Nota: V. D.: Usaría más el transporte público. Significancia al (*) 1 %, (**) 5 % y (***) 10 %.
Fuente: Elaboración propia con base en STATA 14

In general, in this model coefficients with correct significance levels were obtained. The factors considered as determinants of the quality of the service showed positive trends; This suggests that when increasing it impacts the level of user satisfaction.

On the other hand, the factors related to the time and distance of the journey were negative, which indicates that an increase in these factors turns into dissatisfaction, as the quality perceived by the user decreases. The factors considered are significant at 99% and 95% confidence intervals.

From the previous model, it can be observed that the accessible price factor obtains the highest and also positive coefficient, which increases the probability of user satisfaction by 2.09 times. Followed by this is the schedule of the routes, which increases this probability 1.7 times more. Subsequently, the subjective factor arises: the staff inspires confidence (1.40 times more), the planning of the route (1.33 times more), the service covers the needs (1.25 times more) and the road infrastructure (1.23 times more).

In absolute terms, the price of the trip, followed by the planning, has a greater weight in its effect on the value of satisfaction for two reasons: cost and travel. The first factor is related to the cost paid and the perceived value of the service, in which its effect on perceived satisfaction is the most important. The second is associated with the planning of the route, and in turn involves other factors such as the waiting time and the distance of the route, which resulted in a negative effect on satisfaction.

Based on the results, the increase in service satisfaction (utility) without the increase in the price of transport is related to the implementation of measures that offer a more formal aspect, which would generate more confidence in users. In the same way, the planning of the routes would increase the congruence of the schedules, as well as the coverage of the needs, which would reduce the waiting time and the distance of the route.

From an economic perspective, this increase in user satisfaction requires greater investment, as well as strategic and tactical adjustments in the planning of the public transport system in Colima.

Discussion

The underlying question in this research was the following: are university students satisfied with the public transport service in the state of Colima? Based on the previous results, it can be stated, in general, that the answer is affirmative.

However, when introducing a cohort by city and sex, differences were found in both models, which also explain the usefulness of public transport, since coefficients with non-significant statistical values and counterintuitive results were found, which are shown in Table 5.

To strengthen an economic valuation, it is generally necessary to check the precision of the estimates; Therefore, in this research, the confidence intervals of the factors were estimated for the following two models. From these, it was obtained that the accessible price factor is a significant constant in both models, therefore, it was used as a dependent variable in accordance with previous studies (Sánchez-Flores and Romero-Torres, 2010), which demonstrated a significant impact and positive in the perception of the quality of the public transport service.

Tabla 5. Regresión *bilogit* de la satisfacción del servicio por cohorte de ciudad y sexo

Factores	Coeficientes	Diferencias de varianza [1]	*P*-valor [2]	Razón de probabilidad
Ciudad (CV=1; Tec=2; Mzo=3)	-0.1677	.0001	0.006*	0.8455
Sexo (hombre=1; mujer=2)	0.1197	0.0705	0.071**	1.1271
Número de observaciones	456			
	Chi-cuadrado	R- cuadrado		
Razón de verosimilitud	0.0060	0.0052		

[1] Las pruebas utilizadas para el análisis de varianzas fueron t Student para el sexo y H Kruskal Wallis para las ciudades debido a que existía normalidad y una no normalidad en la distribución en los respectivos factores analizados. [2] Significativo al (*) 1 % y (**) 5 %.

Fuente: Elaboración propia con base en STATA 14

From the previous models, it is observed that they are consistent given the significant values of the analysis of variances. Likewise, the value of the likelihood ratio and its significance show that these models were correctly estimated and can be used for prediction.

In this sense, the city coefficient is negative with respect to cities; For this reason, a user from Colima-Villa de Álvarez perceives a higher quality with respect to the price paid for the

public transport service compared to another user from Tecomán or Manzanillo. As a user goes from Colima-Villa de Álvarez to Tecomán, and later to Manzanillo, the probability of utility of the public transport service decreases by 0.16%. This is because a user from Manzanillo is more critical (because he is less likely to perceive the quality of the service of the TP that he pays) than another who lives in Tecomán or in Colima-Villa de Álvarez. Such results are similar to those of other research on this topic (Morton et al., 2016; Sánchez-Flores and Romero-Torres, 2010), which specifies that a structure of eight indicators for the analysis of the quality of the transport service public allows a useful representation of this analysis.

Now, from the analysis between the value of the coefficients for both men and women, the latter (compared to those) will have an increase in satisfaction of 1.12 times in terms of the probability of perceiving the quality of the service they pay. by the TP. This means that men are more demanding than women in terms of PT service expectations.

Finally, regarding the main objective of this research (that is, to show the additional information generated to analyze in more detail the indicator of satisfaction with the PT service of university students in the state of Colima), it can be stated that three Latent constructs that cover issues related to schedule, price, staffing, meeting needs, time, distance, infrastructure, and route planning, which will likely increase perceived satisfaction among passengers. In addition, it can be noted that women are more satisfied than men with the service and that the city of Colima provides better public transport services than the municipalities of Tecomán and Manzanillo.

Conclusions

The objective of this research was to estimate the factors that intervene in the perception of the quality of urban public transport service in the state of Colima. The scale that was designed for this purpose included 13 factors: congruent schedule, accessible price, staff inspires trust, service meets need, pleasant stay, staff attends, sufficient space, units in good condition, waiting time, travel distance, road infrastructure , route planning and risk management.

The results show that, from the satisfaction for the users, the factors that were significant were the following: congruent schedule, affordable price, trust-inspiring staff, service meets the needs, waiting time, distance of the journey, road infrastructure and route planning , which have a higher probability of impact on the quality of public transport service.

Likewise, in parallel, the factors that intervene in the perception of the quality of service of urban public transport in the state of Colima were estimated, as well as the application of a discrete choice utility model to weigh and assess the factors that impact on the quality of service. In this sense, the importance given by the different cities analyzed, as well as the effect of sex on statistically significant factors, provide decision information for state and municipal officials to establish general measures to manage better PT strategies in each city analyzed. In fact, the results of the analysis carried out showed the implications of these data for a subsequent study on the needs and improvements that can be made in terms of mobility.

The latter would not imply an increase in the rate or economic profits, but rather an increase in the satisfaction of PT users. However, it is important to take into account the effect of representativeness of the population, since the data analyzed correspond to the particularities of the students in the state of Colima.

In general, this research reflected the added value that can be obtained through a more exhaustive analysis of the existing data on the services offered to university students. In fact, with the increase in available data, important opportunities arise for further work that could start from secondary data that have a direct relationship with the social agents related to the elaboration of public policies.

Future lines of research

The main limitation of this research is that its results (being a non-probabilistic study) do not show in a representative way all the users of public transport in the state of Colima. In addition, this was an inquiry developed with an emphasis on the student's point of view, and not that of the directors.

Therefore, other user profiles can be included to corroborate or not the results shown. Likewise, a future line of research may take into account that the results of this research show the presence of an undervaluation of the perception of the price to be paid by users in relation to cities and sex. This suggests that improvement strategies should be implemented with reservations due to their implications in the investment area, as well as planning adjustments of the public transport system in Colima. In other words, this model can establish its own methodological design depending on the national context.

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