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Original Article

Modeling user perception of bus service quality: A case study in Mauritius

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Abstract

This paper evaluates the perceived bus service quality by passengers in Mauritius. Structural equation modeling (SEM) was used to identify the unobserved latent variables relevant to public passenger bus service and reveal the relationships between these latent variables and customer satisfaction. The data were obtained from a customer satisfaction survey collected from 501 participants in Mauritius and three latent variables that described the expected service quality characteristics, namely Vehicle, Management, and Driver. The SEM results revealed that the most significant expectation was the quality of the vehicle that included the cleanliness and vehicle body. The second was driver and crews and the personal attributes of the bus service crew. The third anticipation was the overall management of the service. The findings of this research can provide crucial information for public transport bus operators to enable them not only to retain their current customers but also attract new customers.

Keywords: structural equation modeling, satisfaction, bus service quality, Mauritius, factor analysis

1. Introduction

Passenger transportation systems help to ensure that people can reach their everyday destinations, such as workplace, school, healthcare facility, and healthy food outlet safely and reliably. Public transportation systems include a variety of modal options such as buses, light rail, and subways. These systems are available to the general public against payment of an optimal fare and run at scheduled times. The purpose of a public transportation system is to increase access to mobility while simultaneously reducing private motor vehicle use and traffic congestion. Public transportation services play an important role in bringing equality in society by enabling mobility for customers who are children, individuals with disabilities, and older adults (Centers for Disease Control and Prevention, 2014).

Mauritius has a public bus transport system covering nearly all of its area with numerous bus stops in towns and villages (Mauritius Traveller, 2016). Public bus service in Mauritius plays a crucial role in the economic development of the country. Not only do the majority of people use bus services for their daily activities but many tourists also use this mode of transportation for mobility around the island. Thus, improvement in the quality of bus services by optimizing travel cost, reducing travel time, and increasing safety can enhance economic progress of the country (Enoch, 2003).

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Service quality measurements have been extensively applied to public passenger transport. It covers many diverse aspects such as comfort, safety inside the vehicle, journey time, accessibility to the service, and the existence of supporting infrastructure (Hensher, Stopher, & Bullock, 2003). Thus, focusing on the development to precisely match the needs of the users is very important to help increase user satisfaction more efficiently.

The main objective of this study was to determine the most important variables for the users of public transport when evaluating service quality and consequently assessing the relative weighting of each of these decisive factors. These findings will be crucial for the formulation of policies to enhance the use of public bus transport (dell'Olio, Ibeas, & Cecín, 2010).

2. Literature Review

This section presents the factors which are indicators of perceived service quality that denote satisfaction. The goal of this literature review was to discover the suitable factors to establish a questionnaire to be the indicators of model accuracy.

Table 1 shows a summary of the service quality dimensions. Various indications of dimensions were revealed that included research that was conducted with the same data without grouping the variables for analysis (Filipović, Tica, Živanović, & Milovanović, 2009; dell'Olio, Ibeas, & Cecin, 2011; Vetrivel, Muralidharan, Nambirajan, & Deshmukh, 2014) and grouping the variables (Wen, Lan, & Cheng, 2005; González-Díaz & Montoro-Sánchez, 2011; Goh, Currie, Sarvi, & Logan, 2014). In Table 1, the numbers of latent factors were in the range of 2−4 latent factors. However, most of them engaged 3 factors (de Oña, de Oña, Eboli, & Mazzulla, 2013; Jomnonkwao & Ratanavaraha, 2016; Morton, Caulfield, & Anable, 2016; Ratanavaraha, Jomnonkwao, Khampirat, Watthanaklang, & Iamtrakul, 2016). Actually, when taking the observable indicators into consideration, the clearly distinguishable topic was vehicle as a latent factor (some research called it comfort) and latent factors related to the driver. The group of irrelevant research indicators included bus stop and frequency information; therefore, they should be grouped.

Vehicle: This latent variable concerns vehicle conditions which are considered the main factor of service quality (Ratanavaraha *et al.*, 2016). This study considers the exterior and interior of the vehicle body since they make direct contact with the passengers. Additionally, the users initially consider safety in terms of the physical condition and appearance of the vehicle. The newer it appears, the safer it is perceived to be (Deb & Ali Ahmed, 2018). Users then consider the interior characteristics of the vehicle including seating comfort, nice and clean decent appearance of the vehicle body, cleanliness (Hensher *et al.*, 2003), and the temperature inside (Güner, 2018). It was found that users put a great emphasis on vehicle cleanliness (Jomnonkwao & Ratanavaraha, 2016). In the literature, a few hypotheses were put forth.

H1: Vehicle characteristics have a positive and direct effect on passenger satisfaction.

Driver: This dimension is important to users because getting friendly service normally meets the expectations of the users (Ratanavaraha & Jomnonkwao, 2014). The interesting issues in many studies were the personal attributes of the driver such as politeness, kindness, and friendliness. These were the crucial indicators of the driver and crews (Eboli & Mazzulla, 2007; Cafiso, Di Graziano, & Pappalardo, 2013a, 2013b).

H2: Management of bus operators has a positive and direct effect on passenger satisfaction.

Management: This dimension concerns the overall management of the passenger bus service operation which consists of a variety of main parts.

- Suitability: An important part is the suitability of the bus stop in terms of a safe location or near the community, and in some cases the walking distance (Tyrinopoulos & Antoniou, 2008; Deb & Ali Ahmed, 2018; Suman, Bolia, & Tiwari, 2018). The comfort of the bus stop seats and sufficient bus stops for waiting passengers (Shaaban & Khalil, 2013) were relevant in the study by Deb and Ali Ahmed (2018) which found that accessibility was the most important as a perception indicator. Tyrinopoulos and Antoniou (2008) suggested that information provided at a bus stop was important for the users and their decisions. Also important was the physical structure of the bus stop that included, for example, a roof for protection from the sunlight and rain (Eboli & Mazzulla, 2007).
- Punctuality: This relates to running the bus on a fixed schedule for easy accessibility. According to a study by Sam, Hamidu, and Daniels (2018), it was found that bus punctuality is of high importance and was rated second place after responsibility and daily activity service. From a study by Guirao, García-Pastor, and López-Lambas (2016), it was found that the importance of service routes was the highest priority of the bus service.
- Information: This service provides complete information such as a clear schedule of bus departure times which are easy to understand so that the bus user can choose the right vehicle and can manage the time, especially during rush hours (Mahmoud & Hine, 2016; Deb & Ali Ahmed, 2018) as well as in-depth job training and knowledge of the staff personnel.
- Convenience of buying tickets: Choices of channels in which to buy tickets and make payment and receive the tickets as well as return tickets was found to be important (González-Díaz & Montoro-Sánchez, 2011).

H3: Driver attributes have a positive and direct effect on passenger satisfaction.

We aim to discover the factors affecting the level of satisfaction measured by comparing the expectations and perceptions of the users. The factors that affect user satisfaction are in three groups: (1) vehicle consisting of vehicle body suitability, bus seat characteristics, cleanliness,

Table 1. Summary of service quality dimensions.

Authors (Year)	Type of public transportation	Analysis method(s) / No. of group(s)	Service quality dimensions
Sam, Hamidu, and Daniels (2018)	Bus	Regression/5	Reliability, Assurance, Tangibility, Empathy, and Responsiveness
Suman, Bolia, and Tiwari (2018)	Bus	Multinomial Logistic Regression/NA	Fare, Safety, Accessibility, Directness, Availability, Punctuality Buses, Comfort, and Time
Güner (2018)	Public transportation	Multiple-criteria/2	1. Convenience (pan of service, frequency, network coverage and air-conditioned vehicle rate) and 2. Comfort (capacity, number of bus stops per km, vehicle occupancy rate, average speed and route directness)
Deb and Ali Ahmed (2018)	City bus	Linear regression analysis, and SEM/4	Safety, comfort, accessibility, and timely performance.
Guirao, García-Pastor, and López-Lambas (2016)	public transport	Factorial Analysis MIMIC models/3	1) Service: Punctuality, Information-service, and Frequency 2) Integration: Route, Connections, Access, Journey time 3) Supplementary Features: Cleanliness, Possibility of sitting, Comfort
Morton, Caulfield, and Anable (2016)	Bus	Factor Analysis/3	1. Convenience (e.g. frequent, service runs, on time, stable and bus isn't regularly changing). 2. Cabin environment (e.g. clean, comfortable, safe and secure). 3. Use issues (e.g. finding out about routes and times, ticket, easy changing from buses to other mode).
Mahmoud and Hine (2016)	Bus	Binary logistic regression model/NA	Comfort, transfer requirement, stop location, park and ride availability, waiting time, reliability, frequency, information, fare, discounts and safety.
Ratanavaraha, Jomnonkwao, Khampirat, Watthanaklang, and Iamtrakul (2016)	Sightseeing buses	Multilevel SEM/3	Type of vehicle, driver response, and bus management.
Jomnonkwao and Ratanavaraha (2016)	Sightseeing buses	Hierarchical confirmatory factor analysis/3	1) Vehicles (e.g. noise from engine, clean, air-conditioning system, entertainment facilities, vehicle body, toilet, Installation safety equipment). 2) Drivers and crews (e.g. Good personality, friendly, service willingness, driving skills, driving safely, driver's knowledge). 3) Management (e.g. contact system, pre-trip inspection, suggestion of safety equipment usage, driving law).
Ratanavaraha and Jomnonkwao (2014)	Sightseeing buses	Confirmatory factor analysis/1	Bus drivers in terms of age, experience, education, driving license, driving skill pertaining to the route, training, and no drinking or smoking.
Vetrivel, Muralidharan, Nambirajan, and Deshmukh (2014)	Urban buses	Discriminant analysis/NA	Bus punctuality, seat comfort, cleanliness, lighting and entertainment, new fleet addition, seating for handicapped, seating for elderly, issue of proper ticket, in-time issue of ticket, issue of proper change, stopping bus at correct place, backup service during breakdown, provision for luggage, obey traffic rules, first aid facility, driver behavior, conductor behavior, and information to passengers.
Goh, Currie, Sarvi, and Logan (2014)	Bus	Mixed logit modelling/3	Temporal (Roadway/environmental, vehicle and driver about road type, speed limit, traffic/lighting conditions). Vehicle (bus priority, bus age/length) and Driver (driver's age/gender/experience/historic at fault accident record.)
Cafiso, Di Graziano, and Pappalardo (2013)	Urban buses	Kendall's algorithm/3	Drivers (training, skills, performance evaluation and behavior), vehicles (maintenance and advanced devices) and roads (road and traffic safety issues).
de Oña, de Oña, Eboli, and Mazzulla (2013)	Urban buses	Measurement model in SEM/3	Service (Frequency, punctuality, speed, proximity, fare). Comfort (cleanliness, space, temperature) Other (information, safety, courtesy and accessibility).
González-Díaz and Montoro-Sánchez (2011)	Urban buses	Qualitative research/2	1) Quality of service outside the vehicle (e.g. safety of baggage, friendliness and diligence dealing with incidents and problems, ease of ticket purchase and friendliness at the point of sales, satisfactory facilities in stations, information on schedules). 2) Quality of vehicle (e.g. driver friendliness, appearance and level of training, exterior cleanliness and condition of vehicle, safety and smoothness of driving, information updates during trip, interior cleanliness and condition of vehicle, quality of on-board services, passive safety and vehicle comfort). 3) Fares and schedule

Table 2. Continued.

Authors (Year)	Type of public transportation	Analysis method(s) / No. of group(s)	Service quality dimensions
dell'Olio, Ibeas, and Cecin (2011)	Urban buses	Ordered probit model/NA	Waiting time, journey time, access time walking to the initial bus stop, safety within the vehicle, comfort during starting and stopping, comfort during the journey, deviation from the optimal route, cleanliness of the vehicle, price of the bus ticket, quality of the vehicle, reliability of the vehicle, and the kindness of the bus driver.
Filipović, Tica, Živanović, and Milovanović (2009)	Mass public transportation	Sample statistics (e.g. frequency)/NA	Station comfort, vehicle comfort, tickets and pricing, information, accessibility in time, spatial accessibility, transport reliability, and staff.
Tyrinopoulos and Antoniou (2008)	Bus, trolley bus and rail (metro)	Factor analysis/4	1) General characteristics of the public transit system (service frequency, on-time performance, service provision hours, network coverage, general information provision, types of tickets and passes, prices of tickets and passes, tickets selling network, personnel behavior, existence of bus lanes, measures for environmentally friendly public transit). 2) Terminals and stops (walking distance to terminals and stops, information provision at terminals and stops, conditions at terminals and stops, safety at terminals and stops). 3) Vehicles (onboard conditions, vehicles cleanliness, driving behavior, onboard information provision, accessibility to disabled and mobility impaired people). 4) Transfer points (distance between transfer points, waiting time at transfer points, information provision at transfer points).
Eboli and Mazzulla (2007)	Campus buses	Measurement model in structural equation modeling/3	Service planning and reliability (reliability, overcrowding). Comfort and other factors (cleanliness, cost, information, safety on board, promotion, personal security, helpfulness of personnel, complaints, environmental protection and bus stop maintenance) and Network design (Bus stop availability, routing, frequency)
Wen, Lan, and Cheng (2005)	Intercity buses	Exploratory and confirmatory factor analysis/4	On-board amenity, crews' attitude, station performance, operational performance.

Note. Applied from Jomnonkwao and Ratanavaraha (2016)

and the inside temperature; (2) driver and bus staff personnel including clothing and friendly service; and (3) management including bus stop characteristics, service frequency, punctuality, purchase of tickets, and appropriate schedules.

3. Material and Methodology

This research focused on the study of user perceptions as a way to develop greater user satisfaction in Mauritius. All operation measures were comprised of nine procedures as shown in Figure 1.

3.1 Data collection

Questionnaire Design: The questionnaire was divided into three parts. The first part included the respondent's personal and household characteristics. The second part was comprised of the passenger's assessment of the bus service in various dimensions. The question items in this study were all acquired from the research and designed to cover the dimensions including vehicle, driver, and other management aspects. These question items were sufficient for bus service efficiency improvement in Mauritius. The third part included the overall satisfaction of passengers traveling by bus.

Scale: The second and third parts consisted of 18 question items assessed by a 5-point Likert scale ranging from strongly disagree (1) to strongly agree (5) (Joewono, Tarigan, & Susilo, 2016). Although they are ordinal variables, they were estimated with maximum likelihood by Kline (2011) who said that "The second option for an ordinal variable was analyzing the parcels. A parcel is the total score across a set of homogeneous items with a Likert-type scale. Parcels are generally treated as continuous variables. The score reliability of parcels (total scores) tends to be gathered rather than for the individual items. If the distributions of all parcels are normal, then the default maximum likelihood estimation can be used to analyze the data".

Sample size: Since this study analyzed the data by confirmatory factory analysis (CFA) in structural equation modeling (SEM), the appropriate sample size needs to be more than 20 times the number of variables (Kline, 2011).

Participants: The survey points were the bus stops and bus terminals throughout Mauritius. The survey days were between Monday and Sunday from January to April 2016. The sampling technique was cluster sampling. A total of 531 respondents answered the questionnaires in nine cities in Mauritius. After removing the incomplete questionnaires, the number of completely functional questionnaires was 501.

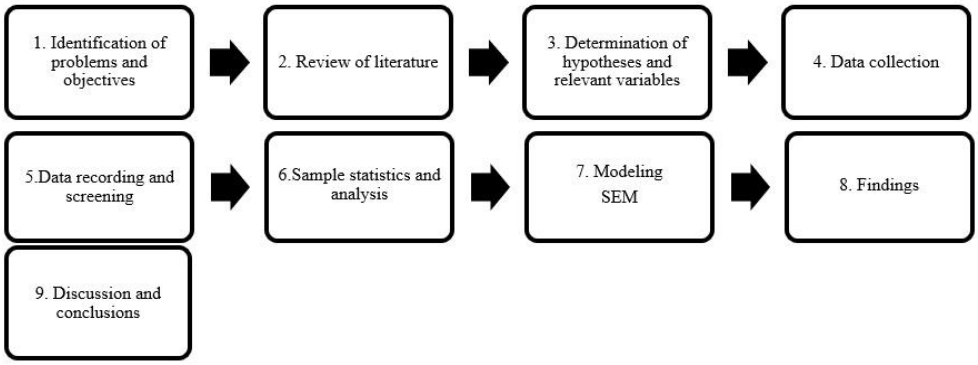

Figure 1. Research methodology.

Table 2 shows the statistics of the general attributes of the respondents. There are more males than females and most of the respondents (39.92%) were between 20 and 29 years old.

Table 3. Respondent characteristics.

Characteristics	Details	Frequency	Valid percent (%)
Sex	Male (1)	333	66.50
	Female (2)	168	33.50
Age	<20	108	21.56
	20−29	200	39.92
	30−39	76	15.17
	40−49	47	9.38
	50−59	48	9.58
	≥60	22	4.39
Highest education level	Upper Secondary/Vocational Certificate (1)	324	64.70
	Diploma/ High Vocational (2)	60	12.00
	Bachelor's degree (3)	109	21.80
	Master's degree (4)	8	1.60
Citizenship (Mauritius)	Mauritian	492	98.20
	Tourists	9	1.80
Average income (Mauritian Rupee, MUR)	≤15000	316	63.07
	15000−30000	151	30.14
	>30000	34	6.79
The travel experience, have you ever faced a problem of bus breakdown on the way?	Yes (1)	405	80.80
	No (2)	96	19.2

3.2 Factor analysis

There are two types of factor analysis: exploratory factor analysis (EFA) and CFA. EFA is the method used to investigate and identify common factors which can explain the correlation between observable variables. Although theoretical indicators of bus quality service have been copiously studied, the study area context, in this case it is Mauritius, has unique characteristics such as small area and the attitude of the users is indispensable towards the bus. This study used EFA to group variables into the dimensions of bus service to compare the different dimensions and interpret the details according to the question items. The results were subsequently taken to build the measurement model according to CFA.

3.3 SEM

SEM is a statistical method used to examine the relationship between variables by measuring the relationship between observed variables and latent variables (unobserved variables). In addition, when finding the relationship between the variables, the causes between the variables may be found along with the relationship between the simultaneous variables or the relationship between variable groups. SEM has two models. The first is a measurement model which is an indication of each latent variable measured by the observed variables. The second is the structural model which is a causal model consisting of latent variables. The details of SEM were described by Hair, Black, Babin, and Anderson (2010) and Kline (2011).

Thus, SEM was the method used in this study by considering the structural model to obtain the relationship between different service dimensions. This resulted in service satisfaction which means the perceived bus service in Mauritius and each measurement model was consecutively analyzed to acquire the highest regression weight to consequently propose for a policy.

4. Findings

4.1 Descriptive statistics

Table 3 shows the statistics of the opinions concerning public bus service quality. The results are shown as mean, standard deviation, skewness, and kurtosis. For the acceptable range of skewness and kurtosis, skewness of all variables should be in the range of −3 to +3, and kurtosis the value should not be over 10 (Kline, 2011). The overall relationships between the variable values from low to high showed a maximum correlation coefficient value equal to 0.790 from the relationship between V17 and V18. However, the relationship between V13 and V17 has the lowest correlation coefficient of 0.007. The reliability value using Kaiser-Meyer-Olkin was 0.655 which was greater than 0.5 and close to 1 and Bartlett's Test of Sphericity chi-Square was

Table 4. Descriptive statistics.

	V1	V2	V3	V4	V5	V6	V7	V8	V9
V1	1								
V2	.312**	1							
V3	.300**	.392**	1						
V4	.125**	.160**	.174**	1					
V5	.178**	.197**	.119**	–.088*	1				
V6	.125**	.219**	.151**	.106*	.683**	1			
V7	.142**	.216**	.144**	.113*	–.03	.112*	1		
V8	–.057	.077	–.049	.451**	–.317**	–.173**	.518**	1	
V9	.181**	.188**	.244**	.079	-0.068	.122**	.505**	.417**	1
V10	.388**	.112*	.286**	.148**	.07	.087	.609**	.285**	.455**
V11	.398**	.255**	.448**	–.12**	.266**	.297**	.269**	–.16**	.315**
V12	.292**	.152**	.260**	.183**	.036	.014	.547**	.352**	.454**
V13	.271**	.105*	.223**	.227**	.114*	.065	.380**	.303**	.262**
V14	.132**	.152**	.150**	.314**	–.164**	–.110*	.271**	.570**	.533**
V15	.338**	.037	.069	.271**	.075	.260**	.498**	.214**	.315**
V16	–.082	.068	–.045	.163**	.03	.178**	.091*	.238**	.132**
V17	.189**	.103*	.061	.103*	.206**	.235**	.196**	.067	.047
V18	.148**	.058	–.018	–.048	.046	.183**	.184**	.083	.209**
M	2.49	1.93	1.86	2.38	2.89	2.66	2.54	2.57	2.62
SD	1.213	1.179	1.145	1.036	1.328	1.308	1.293	1.624	1.185
SK	0.275	1.261	1.187	0.141	0.175	0.38	0.054	0.485	0.159
KU	–0.874	0.77	0.316	–0.8	–0.096	–0.972	–1.617	–1.373	–0.678

	V10	V11	V12	V13	V14	V15	V16	V17	V18
V10	1								
V11	.307**	1							
V12	.667**	.230**	1						
V13	.571**	.052	.502**	1					
V14	.266**	.062	.296**	.403**	1				
V15	.635**	.212**	.613**	.346**	.240**	1			
V16	.098*	.065	.093*	.119**	.190**	.226**	1		
V17	.147**	.055	.233**	.007	.013	.401**	.453**	1	
V18	.077	.055	.189**	-0.043	.04	.300**	.487**	.790**	1
M	2.34	2.13	2.68	3.48	2.64	2.71	2.87	2.55	1.99
SD	1.351	1.154	1.434	1.385	1.343	1.317	1.324	1.42	1.033
SK	0.392	0.317	0.112	–0.281	–0.165	0.203	–0.072	0.464	0.679
KU	–1.302	–1.355	–1.37	–1.252	–1.622	–0.902	–1.163	–1.062	–0.42

M=Mean, SD=Standard Deviation, SK=Skewness, KU=Kurtosis.
** Correlation is significant at the 0.01 level (2-tailed), * Correlation is significant at the 0.05 level (2-tailed) for all pairs.

4510.432 (P<0.000) (Ratanavaraha & Jomnonkwao, 2014). This indicated that the variables were related. The communalities value should be close to 1. Table 4 found that the extraction communality value of V2 had the lowest value of 0.593 but it was acceptable. (Jomnonkwao & Ratanavaraha, 2016). It was concluded that the available data were suitable for further SEM analysis.

4.2 EFA

The results from the EFA in the first part were considered for the number of factors in the scree plot (Figure 2) that represents the eigenvalues of the various variables. According to the principle, the values of the eigenvalues must be greater than 1. In the range of 1−4 factors, the eigenvalues tended to obviously decrease. However, from the number of 5 factors onwards, the eigenvalues decreased slightly. Therefore, the number of suitable factors was 4 factors which corresponded with the review in section 2. No indicators were removed from the additional results from the EFA. In terms of loading factors, they were found in the range of 0.311−0.974. Although many studies have suggested that the loading factors must be greater (Hair *et al.*, 2010; Carreira, Patrício, Natal Jorge,

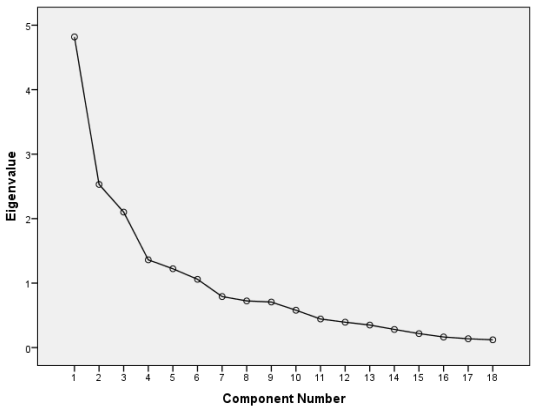

Figure 2. Scree plot.

Table 5. EFA Results.

Code	Indicators	EFA (N=501)			
		Communalities	Loadings [a]	Variance explained (%)	Cronbach's α
	Factor 1: Vehicle			26.766	0.569
V1	Decent appearance of vehicle body	.675	0.500		
V2	Clean and adjustable bus seats with a space between two seats in a row	.593	0.311		
V3	The bus floor is clean without any dust or garbage.	.637	0.390		
V4	While sitting in the buses, the temperature inside is cool, and it is not stuffy.	.779	0.492		
	Factor 2: Driver			14.061	0.812
V5	Good personality and appearance of driver and crew that is neat, clean, and meets uniform standards	.815	0.684		
V6	Friendly, helpful and polite customer service of driver and crew	.856	0.979		
	Factor 3: Management			11.674	0.822
V7	Bus stops have roofs that provide protection from sunlight and rain.	.669	0.520		
V8	Bus stops have enough seats for waiting.	.800	0.966		
V9	Bus stops are suitable.	.757	0.419		
V10	There are enough bus services in rush hours.	.804	0.830		
V11	During the service time of regular bus, you can do activities in the daily routine conveniently.	.693	0.442		
V12	The buses run punctually according to the bus schedule.	.710	0.710		
V13	Ease of purchasing tickets	.601	0.530		
V14	Timetable is clear and easy to understand	.642	0.551		
	Factor 4: Satisfaction			7.562	0.750
V15	I'm very happy to use the service of "this bus services"	.737	0.640		
V16	In overall, I'm very satisfied with the service of "this bus services"	.601	0.508		
V17	Service quality that I perceived is more than I expected	.855	0.797		
V18	Service quality that I perceived is as in my dream	.868	0.974		

[a] all loading factor are sinificant at $\alpha \leq 0.05$

Kaiser-Meyer-Olkin=0.655, Barletts's Test of Sphericity: Chi-Square=4510.432, df=153, P<0.001

& Magee, 2014), recent research stated that the loading factors from EFA can be accepted at values less than 0.3 and 0.4 (Lu, 1999; Cerit, 2000). To confirm the accuracy, CFA was initially conducted to obtain accurate indicators of each factor.

Confidence of the scale was determined by Cronbrach's alpha values and the values were in the range of 0.569−0.822. Actually, the values usually accepted are greater than 0.7 (Bernroider & Schmöllerl, 2013). However, research studies commonly accept the range of 0.5−0.7 which indicates moderate reliability.

4.3 Goodness of fit

The recommended criteria are: (1) the χ^2/df value should be 2−5 for suitability (Marsh & Hocevar, 1985); (2) the root mean square error of approximation (RMSEA) should be less than 0.07 (Steiger, 2007), but one study accepted a RMSEA ≤0.122 (Joewono *et al.*, 2016); (3) the CFI value should be ≥0.90 (Hu & Bentler, 1999; Nghia & Thanwadee, 2018); (4) the Tucker-Lewis Index (TLI) values should be equal to or more than 0.80 (Hooper, Coughlan, & R. Mullen, 2007); and (5) the standardized root mean square residual (SRMR) should be ≤0.70 (Hu & Bentler, 1999). Figure 3 shows the structural equation model of bus service quality satisfaction that consists of χ^2= 409.252, df = 83 (P<0.000), χ^2/df=4.931, RMSEA=0.089, TLI=0.769, CFI=0.929, and SRMR=0.070. Thus, the model construct was fit.

4.4 SEM Results

Table 5 shows the SEM results for a structural model which explores the relationship between the three exogenous variables. The regression weight (RW) values indicated that the vehicle factor had the highest influence on user satisfaction (0.167), followed by the driver factor (0.148), and the management factor (0.105). Thus, with reference to the three hypotheses and the findings from a bus-travel study undertaken by Jomnonkwao and Ratanavaraha (2016), it can be ascertained that the vehicle characteristics were the most effective parameter to affect user perception of passenger bus service.

According to the assessment of the relative weightings of the vehicle factors from the four observed variables, V2 exhibited the maximum loading score of 0.578 followed by V3 with a loading score of 0.515. From the two observed variables of the driver factor, V6 had a loading score of 1.454 which was more important followed by V5 with a loading score of 0.467. From the eight variables of the management factor, V11 exhibited the maximum loading score of 0.833 which was more important followed by V13 having a loading score of 0.754. From the four observed

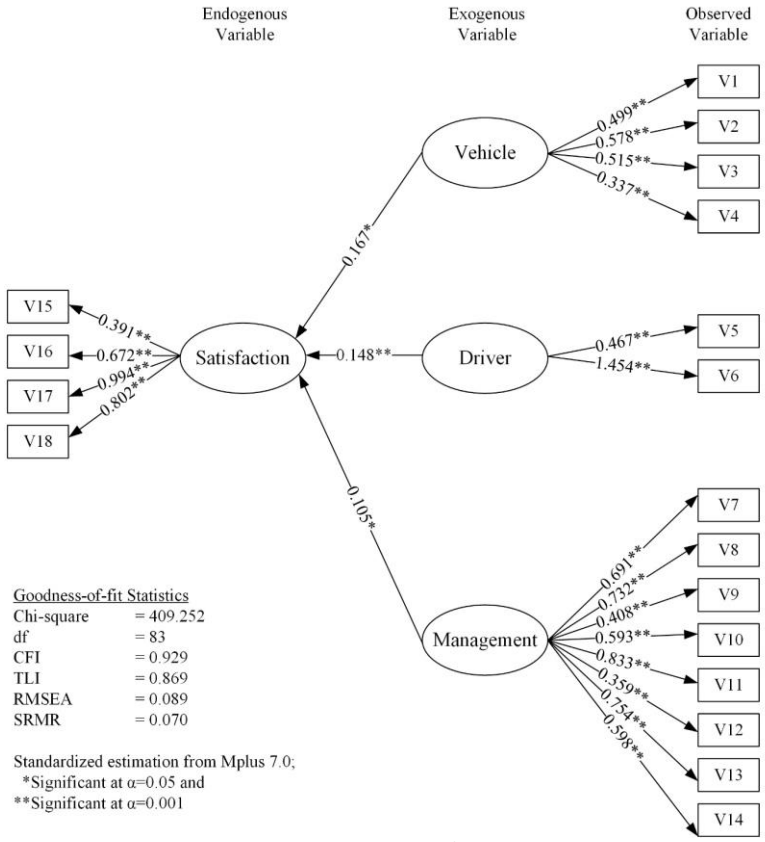

Figure 3. Results of SEM.
DF=Degree of freedom, CFI=Comparative fit index, TLI=Tucker–Lewis index, RMSEA=Root mean square error of approximation, SRMR=standardized root mean square residual.

Table 6. SEM results.

Latent variable	Observed variable	R.W.	S.E.	R.W./S.E.	P value <
Measurement models					
Exogenous variable					
Vehicle	V1	0.499	0.047	10.632	0.000
	V2	0.578	0.042	13.622	0.000
	V3	0.515	0.045	11.452	0.000
	V4	0.337	0.045	7.541	0.000
Driver	V5	0.467	0.096	4.882	0.000
	V6	1.454	0.286	5.086	0.000
Management	V7	0.691	0.029	23.834	0.000
	V8	0.732	0.023	32.047	0.000
	V9	0.408	0.036	11.308	0.000
	V10	0.593	0.031	19.175	0.000
	V11	0.833	0.019	43.403	0.000
	V12	0.359	0.039	9.228	0.000
	V13	0.754	0.023	32.756	0.000
	V14	0.598	0.032	18.917	0.000
Endogenous variable					
Satisfaction	V15	0.391	0.038	10.283	0.000
	V16	0.672	0.036	18.803	0.000
	V17	0.994	0.028	35.356	0.000
	V18	0.802	0.027	30.168	0.000
Structural model					
Endogenous variable	Exogenous variable				
Satisfaction	Vehicle	0.105	0.052	2.034	0.042
	Driver	0.148	0.046	3.202	0.001
	Management	0.167	0.063	2.664	0.008

R.W.=Regression weight, S.E.=Standard Error

variables of the satisfaction factor, V17 exhibited the maximum loading score of 0.994 followed by V18 (0.802).

5. Discussion

On the basis of EFA, it was found that the three variables which can be classified to four groups included endogenous variables which were satisfaction latent construct and exogenous variables which are vehicle (linked to vehicle characteristics), driver (linked to giving service of driver and crews), and management (linked to the different service characteristics such as bus stop, frequency, purchasing ticket, information service).

From the results of the structural model, when comparing three dimensions according to exogenous latent construct from RW, it was found that the vehicle was the most important, followed by driver, and management. Actually, the results are clearly relevant to the Jomnonkwao and Ratanavaraha (2016)'s study which also compared three aspects of service quality and found that the vehicle was the first most significant enhancement in action. For the second and third orders including driver and crew, and management, they were also relevant. Thus, this research can be interpreted that service providers in Mauritius should give priority to the vehicle factor to guide policy in the service dimensions of vehicle, driver, and management.

Vehicle: The measurement model found a significant correlation of all four variables. The dimension of cleanliness of seats and the areas between seat rows as well as that of areas without dust or garbage was consistent with a study by Tyrinopoulos and Antoniou (2008) who stated that vehicle cleanliness was very important to the satisfaction of passengers in both males and females. This dimension was also supported in a study by Jomnonkwao and Ratanavaraha (2016) who found that restroom and seat cleanliness were of prime importance of perceived vehicle service. Another dimension which should be given importance due to the close value of RW is appropriate vehicle body (such as colors and cleanliness of the vehicle exterior) since vehicle appearance affects the experiences in bus service (Carreira *et al.*, 2014). The perfect exterior of the bus results in passenger behavioral intention (Lai & Chen, 2011).

Driver: From the measurement model, it was found that friendly, helpful, and polite driver and crews had the highest RW which could be interpreted as on-board staff personnel behavior which is very important to the service given to passengers. This result was in accordance with a study by Hensher (2014) who discovered that driver friendliness was the main indicator of service quality that resulted in user satisfaction.

Management: Although there are a large number of observed variables, the results are clear which dimension should receive priority by the bus service provider. The factor that should be prioritized is passenger facilities in daily routine while getting service, for example, convenience stores, canteen, especially the punctuality of services covering user activities. This was relevant to a study by Eboli and Mazzulla (2011) that daily service reliability was one assessment of bus service quality, followed by ease of buying tickets because tickets today can be bought only from the conductor or porter or the conductor's assistant. This was similar to a study by Freitas (2013) that ease of ticket buying resulted in satisfaction. Furthermore, additional channels for selling tickets may be proposed, for example, making a reservation via phone call or through the internet. The availability of sufficient seats at a bus stop is another important dimension.

6. Conclusions and Implications

The authors used the structural equation modeling (SEM) method for this study because it was more appropriate and effective for the measurement of a complex phenomenon such as passenger perceptions of the quality of bus service. The managerial implications are the guidance provided to increase user satisfaction with the ultimate goal of increasing the number of passengers.

For the final model, we can deduct and rank the exogenous variables in terms of strength of influence on bus passenger satisfaction of bus service quality. Vehicle had the highest influence followed by driver and management. The findings can be implemented in public transport management and policy formulation. The vehicle body and cleanliness should be emphasized. Also, a check list should be added in the policy to examine both the interior and exterior for vehicle cleanliness before the departure.

The dominant factor that can boost user satisfaction is a friendly and helpful driver and crew. A policy to encourage this dimension would be regular training on service such as being polite and giving full assistance to the bus users. The most important factor in management is reliability in terms of number of hours of daily service coupled an adequate number of bus stops. In addition, attention should be paid to convenience stores and clean restrooms for service in the terminal area. Channels for the purchase of tickets should be added such as telephones, internet, or applications on mobile phones.

7. Limitations and Future Research

This study emphasized the guidelines to increase satisfaction of the vehicle service in Mauritius but the study has some limitations. Overall, there were few differences between the questions used to indicate satisfaction. In future research, the question items should be set more clearly. Another limitation was the scope of the study. The SEM results were obtained from the inquiries of passengers in only Mauritius. In other countries, the results or the weightings of importance may be different. A future study should be able to discuss the efficiency of a variety of service dimensions as well as user attitudes in the area of the study.

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