570

Int. J Sup. Chain. Mgt   Vol. 8, No. 3, June 2019

Sustainable Urban Bus Service Assessment and Tourists' Satisfaction

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Abstract - **This paper evaluates sustainable urban bus service quality based on passenger perception and expectation in local tourism destinations in order to attain a comprehension of tourists' attitudes towards local public transport. The study focuses on the combination of route 101 and 102 by Rapid Penang bus to investigate passenger satisfaction because the bus is the main public transport used by most tourist who use both routes. Data collection by questionnaire survey from 201 valid questionnaires was analysed using sustainable assessment model for both routes. The focus groups of this study are local and foreign tourist as the perceived service quality has a significant positive influence on tourist satisfaction. Moreover, previous experience moderates the relationship between perceived service quality and satisfaction. Results obtained indicate 28 indicators in measuring performance of service quality offered, and 6 vital attributes are identified including; reliability, understanding, accessibility, physical facilities, environment and safety. Gap value obtained are sorted according to worst factor ranking wherein reliability (-1.094), safety (-1.076), physical facility (-1.029), understanding (-1.023), accessibility (-0.792) and environment (-0.772) respectively. This factors have significant effect on overall tourist satisfaction assessment. The findings of this study aims to suggest some interesting implications for practitioners and researchers based on factors that considered important by tourists.**

Keywords— *Bus Performance, Service Quality Gap, Tourists' Perception, Sustainable Assessment Model*

1.   Introduction

Penang has always been a popular tourist destination in Malaysia. As reported by 26,800 domestic arrivals and more than 196,000 international arrivals were recorded in February 2014 [1]. The percentage of tourists came to Penang in the year 2014 were up to 33.4 percent for domestic and 8.23 percent for international compared to year 2013 as he revealed in The Malaysian Insider webpage. This island proud of its beaches, culturally diverse and a lot of heritage attractions, make it as a prominent travel destination for both domestic and international tourists. This highly urbanized, industrialized and thriving tourist destination, Penang contributes the most number of tourists every year. Its heterogeneous population of Penang not spared from facing the problem of traffic congestion. In light of this, the government has introduced an improved transit bus to reduce the traffic woes. A recent study which has been conducted an observation audit based on The European standard on Transportation - Logistics and services - Public passenger transport - Service quality definition, targeting and measurement (EN13816), found that existing public bus services in local tourism area were deemed in compliance [2]. Currently it has emerged some public transport service in Penang tourism areas such as Hop-on, Hop-off Double Decker bus, e-hailing taxi service such as Grab and Uber to meet the tourist demand. Such approach may be one of the best solutions to increase the use of public transportation and reduce traffic congestion. However, some of the earlier study indicates that in order to improve public transport ridership, service should be implemented in a way that puts the level

571

Int. J Sup. Chain. Mgt   Vol. 8, No. 3, June 2019

of services required by consumers [3]. Among the factors that influence tourist satisfaction towards local public transport are Reliability, Accessibility, Time, Environment, Responsiveness and Safety and Security [4], [5].

2.   Literature Review

The evaluation of perceived service quality across many service sectors has been widely adopted SERVQUAL model including transportation and tourism. The SERVQUAL model invented by Parasuraman et al. was being used in many industries for measuring the service quality level of performance [6], [7]. Nevertheless, some researchers argue that there are existing dimensions and aspects that need to be modified to assess the service quality of different types [8], [9]. In this study, the sustainable assessment model, TRANSQUAL has been used to measure the rapid bus service quality level among domestic and international tourist [6]. There are some dimensions has been used to determine the service quality performance that derived from the SERVQUAL scale. The new scale of the 6 attributes indicates that the scale of factor accessibility, environment, reliability, understanding, safety, and lastly is physical facilities.

3.   Methodology

The approaches used in gathering the data are by the quantitative and qualitative method. Technique of triangulation in this study required a combination of different grouped data which are collected by survey and observations. This method allows the researcher to enhance the accuracy of their verdict by collecting various types of data that are beneficial to the same phenomenon [10]. The population of this study were tourist who came to visit Penang island.

Based on Penang Tourist Survey technical report prepared by Omar and Mohamed, the total number of tourists in Penang between March and December 2016 is 4767 population which include 2370 international and 2397 domestic [11]. The population, N = 4500, the appropriate sample size is ± 354 [12].

However, this study applied multi-stage cluster sampling. At the first stage sampling, the researcher listed all bus routes in Penang island. Then, as a result of informal interview conducted with Rapid

Penang's operational staff, two top tourist routes were selected and at least 100 samples were required to conduct multivariate analysis [13]. At final stage of sampling, a total of 201 respondents among local and foreign tourist were randomly selected from both routes. The samples had been collected using on the board and off board methods in order to get the data from various angles and perspective.

Prior to data collection process, an official letter was sent to Rapid Penang's Chief Operation Officer (COO) to for permission to conduct data collection during bus operation. After the permission was obtained, the researchers conduct an early ride on the bus and conduct unstructured interviews with bus drivers as well as the supervisor in identifying the designated respondent. The survey was carried out for weeks during a weekend. The questionnaire survey was conducted, whichever at the bus station, at the bus stop or while on the bus ride. Some respondents undergo a face to face interview to answer the questionnaire on the spot. A well-developed structured questionnaire was used to collect the required data. The instrument was developed by Haron et al. in 2015, for public transportation service quality assessment in Malaysia. The model named as the TRANSQUAL which consist of dimensions, accessibility, reliability, responsiveness, understanding, physical facility, safety, environment, image, time and fare with 38 number of indicators.

4.   Analysis and Results

4.1   Demographic Characteristics

A total of 201 responses was obtained from Rapid Penang's users among domestic and international tourist over a period of several weeks across two survey routes. According to the result, the majority of respondents were female for route 101 and route 102. However, the highest numbers of respondents are dominated by the international tourist (56%) and domestic tourist (44%) for both routes. It is because international tourists fully rely on the public transport during their visit.

In response to the question on the age, it was found that the age between 18 to 30 years old (73%) scored the highest, followed by the age above 31years old (21%), and the lowest score is the age below 18 years old (6%) for route 101. The age between 18 to 30 years old became the highest respondents on this

route because along this route there have more recreational and amusement places. These places will attract younger tourist.

Meanwhile, for route 102, the highest score is the age above 31years old (68%), followed by the age between 18 to 30 years old (25%), and lowest score is the age below 18 years old (7%). According to the analysis, respondents at the age above 31 years old became the highest respondents because majority respondents go to the beaches, museum, and temple that located along this route.

Furthermore, most of the respondents (86%) do not have a vehicle license for route 101. However, for route 102, only (29%) do not have a vehicle license.

4.2 Service Performance Analysis

The statistics were analysed with SPSS Version 22.0. The demographic and bus journey characteristics data were analyses using descriptive statistics. With an aim to delineate the dimensions of bus service performance, factor analysis was used to reduce the items, sort the items under certain construct using principal component as an extraction method with diagonal rotation. In the TRANSQUAL, there are a few phases to determine a set of performance indicator that need an analysis of scores attained from the original items.

4.3 Reliability Test and Factor Analysis

Initial phase begins with a reliability test for responded items. Based on Table 1, the total 10 attributes consisting of 38 items were tested and the result of initial analysis shows the reliability coefficient, Cronbach's Alpha is equal to 0.886. The value was high and considered satisfied, considering that no items need to be eliminated from the research [16].

Table 1: Initial test for Overall Cronbach's Alpha Reliability Scale

Reliability statistics		Scale Statistics		
Cronbach's Alpha	N of Items	Mean	Variance	Std. Deviation
0.886	38	128.70	142.002	11.916

The analysis proceeds by testing the validity of data in order to conduct a factor analysis with the aid of Kaiser-Meyer-Olkin (KMO) and Bartlett's Test of Sphericity. This test is proposed to determine whether all the scrutinized data are sufficient to be factored analyse. The main criteria to be assessed is to accept the value that is larger than 0.5 and values below should either collect extra data or consideration to insert more variables [12].

Through this analysis, by application of factor analysis, the items have been rearranged and modification, duplication and possible removal of these factors, the process of removing and purifying the items is repeated several times until no more items load factor less than 0.5 have to be removed. Based on Table 2 below, the value of KMO is equal to 0.780 which is a good result. The value between 0.5 and 0.7 is an average, value between 0.7 and 0.8 is good, values between 0.8 and 0.9 is a very good and over 0.9 is great [14].

In this case, the value of KMO indicates that the data does not have a serious multicollinearity problem so the items are suitable to be used for the analysis factor. Meanwhile, Bartlett's Test of Sphericity shows the value obtained was significant with p-value less than 0.05 which shows that the correlation between items is also sufficient to do the analysis factor.

Table 2: KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy		0.780
Bartlett's Test of Sphericity	Approx. Chi-Square	3333.032
	df	703
	Sig	0.000

Reliability test is once again confirmed using Cronbach's Alpha after the final analysis and a set of performance indicator is identified. Table 3 shows a Cronbach Alpha final test for overall scale of Reliability Cronbach's Alpha of 0.917.

Finally, the operation is terminated and the result was the one set of performance indicators which consists of 6 factors consisting of 28 indicators after 10 items were removed.

Table 3: Final test for Overall Scale of Reliability Cronbach's Alpha

Reliability statistics			Scale Statistics		
Cronbach's Alpha	N of Items	Mean	Variance	Std. Deviation	
0.917	28	70.75	129.646	11.386	

The result in Table 4 shows the final scale reliability Cronbach's Alpha for each scale of the 6 attributes. Alpha coefficient is point out that the scale of factor accessibility (0.758) has the highest internal consistency, followed by environment (0.702), reliability (0.693), understanding (0.687), safety (0.652), and physical facilities (0.587) falls the lowest in in the consistency of the final Cronbach's Alpha reliability scale. However, it is still within the range of satisfying reliability because dimensions those have more than 0.5 which is acceptable [13].

The finding shows early information to be used later as a reference of a set of performance indicator. The research will expand to achieve the aim of the study on the public transport performance index. Based on the factor analysis completed, out of 10 factors and 38 items offered in the TRANSQUAL Model, only 6 factors and 28 items have been identified that act as strong indicators in evaluating the service quality of Rapid Penang's route 101 and 102. The six factors are including accessibility, environment, reliability, understanding, safety and physical facilities.

Table 4: Factor Loading and Dimension of Service Quality

Dimension	Item	Factor loading
Accessibility (0.758)	Accessing distance from the bus stop to the destination	0.850
	Accessing distance from the house to the bus stop	0.830
	Places / circumstances of a bus interchange to get to the destination	0.717
	Interchange time of bus	0.633
Environment (0.702)	Bus internal and external cleanliness	0.865
	The level of air pollution due to bus emission	0.747
	The level of noise pollution emitted by bus	0.688
	A comfortable temperature inside the bus	0.508
Reliability (0.693)	Bus arrived right on schedule	0.776
	Bus depart right on schedule	0.755
	Journey time	0.729
	Dependable bus schedule	0.634

	Drivers follow the rules, be polite and patient	0.568
	Easy to obtain travel information (fare, schedule and maps)	0.778
Understanding (0.687)	Use language that is easily understood passenger	0.736
	Willingness to hear passengers' complaint	0.706
	Easy to obtain travel information (fare, schedule and maps)	0.684
	Drivers'/operator's aware of the needs of passengers	0.625
	Drivers'/operator's willingness to help when needed	0.595
	Individual safety from criminal dangers at the bus terminal and bus stop	0.716
Safety (0.652)	Well trained competent driver	0.710
	The risk of interference from other passenger on the bus	0.620
	The presence of police and security officer in the designated area	0.563
	A safe and easily recognise the bus stop	0.716
	Facilities at bus stop	0.595
Physical Facility (0.587)	Design facilitates for handicapped passenger boarded the bus and sit comfortably	0.577
	Design facilitates for passenger boarded the bus and sit comfortably	0.536
	Facility at bus station (covered, seating, lay bay, telephone, dustbin)	0.509

4.4 Gap Analysis

Table 5 shows the results of the gap analysis performed after a new dimension resulting from the analysis of data reduction. The *reliability* is a construct that obtained the highest gap score of -1.094. Based on observations and interviews on routes 101 and 102 found that the indicators "Dependable bus schedule" and "Bus drivers abide by the law, is patient and courteous" contributed high dissatisfaction from passengers. In addition, the "Bus arrived right on schedule" and "Bus depart right on schedule" have found by on-site surveys that the buses often not arrive right on schedule due to traffic congestion in some areas along the routes. The idle time is in between 5 minutes to 15 minutes. Tourist passengers feel that they were cheated by the time table.

The second factor is *safety* with an average gap of -1.076. Among the indicators received dissatisfaction from tourists are "The presence of police and security officers in the designated area" and "Well

574

Int. J Sup. Chain. Mgt   Vol. 8, No. 3, June 2019

trained competent driver". Through monitoring along the route found that the tourist police booth is only be located at certain locations such as at Batu Ferringhi and Komtar. The police and security personal only available certain time at the terminal. Most of foreign tourist worried with criminal danger especially during early morning and late evening. In addition, travelers are concerned about driving style through hilly and snaky roads along Tanjung Bungah to Batu Ferringhi route. Furthermore, the "Individual safety from criminal dangers at the bus terminal and bus stop" also unsatisfactory because of the situation in the early morning and late evening seems dangerous because homeless people living in the area.

The third factor is the *physical facility* that obtained an average gap value -1.029. Indicator "Facilities at bus stop" reached the highest dissatisfaction by tourist. Majority of respondents are foreign tourists evaluate the bus stop facilities as very low compared to their country. In addition, buses used on this route mostly do not have facilities for handicapped passenger which reasoned that an indicator "Bus design that provides comfort and easy access for the disabled" rated as unsatisfactory by the tourist. Furthermore, lay-bay facility at the bus stop is not convenient for people with disabilities for boarding and alighting the bus.

The next factor that is in fourth rank by gap value of -1.023 is *understanding*. Indirectly, these factors are involved in the interaction of tourists with the front line staff from the public transportation agencies. By observation, the indicator "Use language that is easily understood passenger" should be improved as the level of English language proficiency by bus driver is still weak. Indicator "Willingness to hear passengers' complaint" and "Drivers' or operator's aware of the needs of passengers" requires a commitment of staff are needed to treat customer complaints and provide immediate responses to the query of passengers.

Followed by a fifth factor that is *accessibility* (-0.792) which is also not satisfactory. Indicator circumstances of the bus interchange to get to the destination and distance to reach the area with bus coverage is considered less sufficient. Therefore, time and bus interchange between routes should be minimized and ticketing systems should be integrated as soon as possible.

Finally, factor that achieved the lowest gap is *environment* (-0.772). An indicator that gets the attention from tourists is "A comfortable temperature inside the bus". The temperature inside the bus is quite hot when the bus full with passengers. In addition, the driver must ensure that passengers feel comfortable during the journey, taking into account the appropriate temperature, especially when the bus filled with passengers. As well, environmental factors involve comfort and cleanliness while waiting for the bus and during the journey such as air pollution and noise pollution emitted by buses should be considered by the agency.

Table 5: Service Quality Gap

No	Factor	Perception	Expectation	Gap
1.	Reliability	3.327	4.421	-1.094
2.	Safety	3.299	4.374	-1.076
3.	Physical Facility	3.345	4.374	-1.029
4.	Understanding	3.371	4.394	-1.023
5.	Accessibility	3.609	4.402	-0.792

5   Conclusions

The gap analysis revealed that there are six significant factors in the study area that have to be upgraded with an immediate action in order to solve the island's traffic woes. From the tourists' point of view shows main factor with highest gap is reliability followed by safety, physical facility, understanding, accessibility and the last factor is the environment.

Accordingly, the result from gap analysis can be used as a benchmark for improving and promoting green environments as the recommendations from the tourists which led to be implemented. Some improvements, especially in the tourists' satisfaction should be reviewed for short term towards establishing a sustainable public transport mode to respond to the theme by Penang state government, "Moving People, Not Cars".

From the observations, the overall experience of international tourists (the majority are above 31 years old) who are fully relying on public buses, are more tolerant and less anxious on board. However, from the interviews, they are not satisfied with poor bus punctuality, and delays because of the changes in traffic condition. They expect the bus drivers to take necessary steps to overcome the problems and advise them on more efficient and smooth routes to take.

The outcomes of this study can be used to measure the current public transportation system, and make strategies and policies for further progress. In addition, it can bring advantages to public transportation agencies in refining their operations and improve to be attractive to travellers, as well as alleviate traffic congestion and minimize harmful effects to the environment.

Acknowledgments

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