ANALYSIS OF FACTORS AFFECTING PASSENGER SATISFACTION ON SERVICE QUALITY IN PUBLIC TRANSPORTATION IN SRI LANKA

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Abstract - Public Transportation Service is outlined as a shared transportation service utilized by the overall public. Bus and Rail services play the most prominent roles as Public Transportation modes in Sri Lanka. Discrepancies in the quality of service provided by both the rail and bus service, has resulted in a modal shift towards privately owned vehicles. The research is conducted in order to investigate the factors that affect the passenger satisfaction on service quality in public bus and rail transportation services and attempts to identify the necessary actions and improvements to uplift the level of passenger satisfaction towards public transportation service. Using a sample of 300 public transport users, the authors conducted an empirical study on a number of variables representing the service quality in public transportation. Study discusses about the SERVQUAL model in explaining about the passenger satisfaction. Questionnaire was also designed based on the five SERVQUAL dimension; tangibles, reliability, responsiveness, assurance and empathy. Data collected were analyzed using Reliability Test, Descriptive Statistics Analysis, Factor Analysis, Chi-square Test for Association, Hypothesis test and Kruskal Wallis test. Results obtained show that the identified service quality factors affect the passenger satisfaction on Public Transportation. The study provides empirical evidence of the factors affecting passenger satisfaction on service quality in Public Transportation in Sri Lanka. The results would be beneficial for the public transport service providers to identify the gap between the quality of service demanded and the quality of service provided. It will also be useful to economists, law enforcement bodies and policy makers to create and implement new policies and strategies for further development of the public transport service. Study emphasizes the value of Public Transportation and the importance of its improvement for the development of the country.

Keywords- Passenger Satisfaction, Public Transportation, Service Quality

I. INTRODUCTION

Transportation is a derived demand and by definition it is the movement of people and goods via a point of origin and destination, by a mode of transport (Rodrigue & et al, 2006). Most commonly used modes of transport include rail, road, air, water and pipeline.

Public Transport is a shared service available for the General Public to travel between an origin and destination (Ranawana & Hewage, 2015) Sri Lanka's Public Transport System inclusive of both road and rail are termed as least appealing aspects of the country, by its General Public.

It has been found 51.9% of population uses Public Transport, while 44.1% makes use of Private Transport (Hiranand, n.d.). Above statistics further explains that more than half of the population uses Public Transportation, even with the availability of mere 5.7% of Public Transport Service.

High private vehicle usage results in excess fuel consumption, overuse of infrastructure and superstructure facilities, pollution and furthermore. It affects the financial, economic and environmental stability of the country (Policies To Enhance Sustainable Development, 2001).

Benefits of using Public Transportation have been identified throughout the world including country's Governments, Policy Makers, Transport Operators, Economists, Health Organizations as well as Environmental Organizations. As a result most countries are continually investing more on developing Public Transport Facilities. (Ranawana & Hewage, 2015).

Efficient operation of the Public Transport is a key factor for improvement of living conditions. Exploration of service quality of bus and rail service is essential to provide a better service in the future.

A. Research Problem

At present the use of private vehicles are on the rise creating many challenges to the economy, society and environment. Use of Public Transport by Sri Lankans has dropped to 50% which was 75%, 20 years ago (The Sunday Times, 2015). Public Transport System has gravely failed to provide people an efficient service and irregularities and inefficiencies of the Public transport System has become an accepted norm (Karunarathne, 2015).

Modal shift towards private vehicles results in higher number of vehicles on the roads which further results in congestion, increase of time taken to travel between two points , increase of fuel burnt, increase of emission rates and environmental pollution as well as it affects adversely on the health of the population.

Higher the quality of service provided by the public transport services, higher will be the passenger satisfaction and more passengers will be attracted towards the use of public rail and bus transport services, which will have a positive impact on the country's economy, society and the environment.

B. Research Objectives

- To find and analyze factors affecting passenger satisfaction on service quality in Public Bus Transportation in Sri Lanka.
- To find and analyze factors affecting passenger satisfaction on service quality in Rail Transportation in Sri Lanka.
- To identify how the identified service quality factors affect the transport development of the country.
- To identify the areas of improvement required in bus and rail transportation service.

C. Significance of the Research

The study identifies the factors affecting service quality in public bus and rail transport services in Sri Lanka which will be beneficial to the Public Bus and Rail Transport service providers, economists, law enforcement bodies, policy makers and the other related authorities to identify the gap between the qualities of service provided and the quality of service demanded and to take necessary steps and actions to improve the service.

By looking in to the factors identified in the study auxiliary services provided in rail transport service including service announcements, food availability and lavatory facilities can also be improved for the betterment of the passengers by the relevant authorities.

Through the study Government can obtain an understanding on the perception prevailing among the General Public regarding the public transport service in Sri Lanka. Identified service quality attributes can be further analyzed and the Government authorities can take necessary steps to improve the quality of service and attract more passengers towards the use of public transport service which is a major requirement under the current prevailing traffic conditions in the country.

Study would be beneficial to the other researchers and academic writers to obtain information regarding the

service quality attributes that affect passenger satisfaction on both Public bus and rail transport services and to conduct further studies and analysis using the information obtained from the study.

II. METHODOLOGY

A. Sample and data

Primary Data collection technique was used in the study. It was carried out using a Questionnaire which was prepared based on published studies, in depth reviews as well as extreme brain storming. Questionnaire was designed to relate to the 5 SERVQUAL Model dimensions; tangibles, reliability, responsiveness, assurance and empathy.

Population selected for the research is the Public transport users (bus and rail) in Sri Lanka from which the sample is selected according to the simple random sampling technique. Where respondents were selected randomly at bus stands and railway stations and were asked to rate their overall satisfaction with Public bus and rail transport services and service quality attributes that influence their satisfaction. Simple random sampling was used due to the ease of assembling the sample as well as it gives an equal opportunity for each member of the population to be selected for the sample. Sample size was taken as 300 based on the service quality factors considered.

Service Quality attributes considered for the study and the overall passenger satisfaction towards public bus and rail transport service were evaluated using a 5 point Likert scale. (Highly Dissatisfied-"1", Dissatisfied-"2", neither Satisfied or Dissatisfied-"3", Satisfied-"4" and Highly Satisfied-"5")

B. Data Analysis

Reliability test, Descriptive statistics analysis, Chi Square test for Association, Factor Analysis, Hypothesis Testing and Kruskal Wallis Test are the Research Methods used for conducting the study.

Reliability test is conducted in order to identify the internal consistency of data. A Cronbach alpha value of 0.937 is obtained from the data collected to the subject study, which showed that the internal consistency is very high and the variables can be combined as a result.

Descriptive Statistics Analysis was performed to analyze the demographic variables including age, gender and purpose of travel. The relationship of the mentioned factors with the passenger satisfaction on public transportation was also analyzed.

A chi square test for association was conducted to measure the relationship between the passenger satisfaction on service quality in public bus and rail transportation services and the demographic variables; age, gender and purpose of travel.

To explore the factors which affect the service quality in Sri Lanka a Factor Analysis was conducted. Identified two factors were named as Bus Passenger Satisfaction and Rail Passenger Satisfaction based on the variables under each factor. Two factors were further subdivided and grouped based on the SERVQUAL Model dimensions for further analysis through Hypothesis Testing. Dependence of the variables under the identified two factors on passenger satisfaction in Public Transportation were measured using the Kruskal Wallis Test.

III. EXPERIMENTAL DESIGN

Service Quality is a complex multi-dimensional construct that requires standardized methods of analysis of customers' perceived expectation and performance gaps (Mikhaylov & et al, 2015). Exploratory Research Design techniques were used for the study, where the problem statement is first stated, situation is analyzed and then the research questions are defined and finally the research objectives are stated in manner to match with the research questions defined.

Research is conducted based on Primary Data, where questionnaires were designed to match the five dimensions in the SERVQUAL model. For public bus passenger satisfaction 24 service quality attributes were discussed under the five SERVQUAL dimensions, whereas 22 service quality attributes were discussed for public rail passenger satisfaction.

Service quality attributes identified such as travel time, waiting time, punctuality, journey time, service announcement and ticketing time etc. were considered as the independent variables and the dependent variables are the level of passenger satisfaction on public bus and rail transportation service with the categorical variables, highly dissatisfied, dissatisfied, neither satisfied nor dissatisfied, satisfied and highly satisfied. Conceptual framework for the study is depicted through Figure 1.

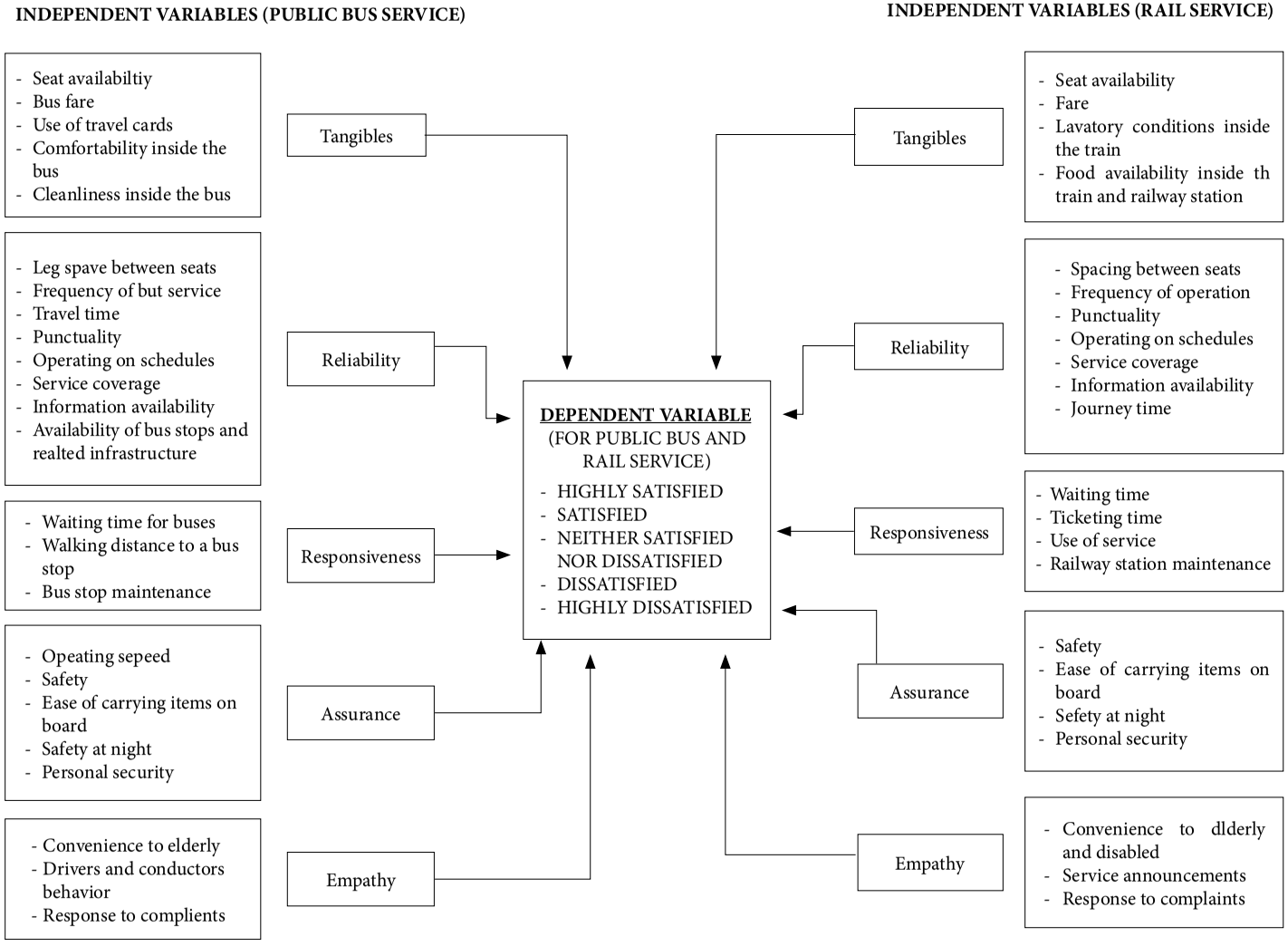

Figure 1. Conceptual Framework for Level of Passenger Satisfaction on Service Quality in Public Transportation Service

IV. RESULTS

Through descriptive statistics analysis it was found that 60% were males and 40% were females out of the total respondent population. 34% of the total respondents are between the age group of 25-35 years, while 29% of the total respondents are between the ages of 15-25 years. 54% of the respondents travel for the purpose of working, whereas 67% of the respondent population are only bus passengers and 16% utilize both the bus and rail modes of transport. Descriptive statistics further analyses that majority of both the bus and rail passengers has rated the overall satisfaction level as neither satisfied nor dissatisfied. However percentage of rail passengers who has rated the satisfaction as satisfied is almost similar to the percentage of respondents who has rated the service as neither satisfied nor dissatisfied.

Reliability test produced a Cronbach alpha value of 0.937, which showed that there is a higher internal consistency between the items. As the Cronbach alpha value is high and as a result the items can be grouped together, variables were grouped based on the SERVQUAL dimensions for further analysis.

Chi square test for Association was conducted to identify the dependence of the demographic variables on passenger satisfaction on service quality in Public bus and rail services. It can be identified that the passenger satisfaction on public bus service is dependent on the variable, purpose of travel and passenger satisfaction on public rail service is dependent on the variable gender, where ($p<0.005$).

Table 1. Relationship between the Demographic Variables and the Bus Passenger Satisfaction on Service Quality

Variable Name	P-value
Age	0.063
Gender	0.109
Purpose of Travel	0.001

Prior to Factor Analysis KMO and Bartlett's test was conducted to measure the adequacy of the sample and the strength of the relationship among the variables. KMO test statistic value was 0.972 which proved that the sample was very much adequate to conduct the factor Analysis.

Through the rotated component matrix, variables were categorized between two extracted variables; Bus Passenger Satisfaction and Rail Passenger Satisfaction. Variables under Factor 1; Bus Passenger Satisfaction include seat availability, leg space between seats, frequency of bus service, waiting time for buses, walking distance to a bus stop, travel time, punctuality, bus fare, use of travel cards instead of tickets, operating speed, safety, comfortability inside the bus, operating on schedules, service coverage, information availability (departure times etc.) , cleanliness inside the buses, convenience to elderly and disabled, ease of carrying items on board, drivers and conductors behaviour, bus stop maintenance, safety at night, personal security and response to complaints. Variables under Factor 2; Rail Passenger Satisfaction include seat availability(capacity), spacing between seats, operating on schedules, punctuality (on time), waiting time, service coverage, frequency of operation, availability of information (departure info, destination and time), fare, ticketing time, use of e-services (book tickets through mobile etc.), journey time, service announcements, convenience to elderly and disabled, personal security, safety, railway station maintenance (adequate infrastructure and restrooms etc.), lavatory conditions inside the train, food availability inside the train and railway station, response to complaints, ease of carrying items on board and safety at night.

Table 2. Relationship between the Demographic Variables and the Rail Passenger Satisfaction on Service Quality

Variable Name	P-value
Age	0.207
Gender	0.000
Purpose of Travel	0.446

Figure 2 shows the scree plot which depicts that the number of factors to be retained is two as the curve begins to flatten between 2 and 3. Table 3 explains the Total Variance explained by the identified two factors.

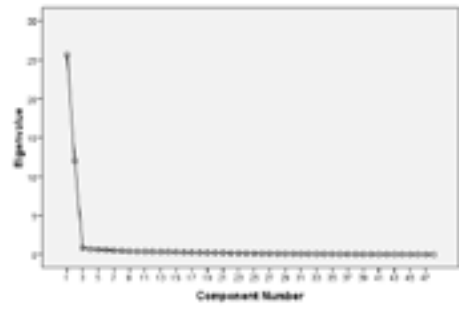

Figure 2. Scree Plot

Table 3. Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	25.623	53.381	53.381	25.623	53.381	53.381	20.283	42.256	42.256
2	12.054	25.112	78.493	12.054	25.112	78.493	17.394	36.238	78.493

Variables under each factor were grouped in to the dimensions of the SERVQUAL Model and Hypothesis Testing was conducted Through the Kruskal Wallis Test dependence of grouped variables on passenger satisfaction on service quality in public bus and rail services were measured.. Significance levels of the grouped variables, where ($p < 0.005$) obtained from the hypothesis testing are shown in Table 4 and Table 5. All grouped variables accounted for a p-value of 0.000 which is highly significant. Hence it can be concluded that the identified service quality attributes affect the passenger satisfaction on service quality in public transportation.

a. Hypothesis Testing for Factor 01 – Bus Passenger Satisfaction

H_o: Bus Passenger Satisfaction is independent from the ith variable

H_A: Bus Passenger Satisfaction is dependent on the ith variable

i^{th} variable – tangibles, reliability, responsiveness, assurance, empathy

Table 4. Kruskal Wallis Test Statistics

Variable Name	Kruskal Wallis Test Statistics	P-Value
1. Tangibles_B	257.97	0.000
2. Reliability_B	269.97	0.000
3. Responsiveness_B	234.15	0.000
4. Assurance_B	261.86	0.000
5. Empathy_B	236.63	0.000

b. Hypothesis Testing for Factor 02 – Rail Passenger Satisfaction

H_o: Rail Passenger Satisfaction is independent from the ith variable

H_A: Rail Passenger Satisfaction is dependent on the ith variable

i^{th} variable – tangibles, reliability, responsiveness, assurance, empathy

Table 5. Kruskal Wallis Test Statistics

Variable Name	Kruskal Wallis Test Statistics	P-Value
1. Tangibles_R	309.72	0.000
2. Reliability_R	314.82	0.000
3. Responsiveness_R	311.97	0.000
4. Assurance_R	314.85	0.000
5. Empathy_R	312.60	0.000

V. DISCUSSION

A. Discussion of Research Questions

Findings of the study show that there is a strong opinion of the public that the public transportation service quality needs to be improved. This indicates that there is a dissatisfaction of the passengers about the current public transportation service. However only 6.7% of the rail passengers are dissatisfied of the rail transport service whereas 24% of the bus passengers are dissatisfied

of the service. 6.4% of the bus passengers are highly dissatisfied of the overall service quality, whereas only 1.5% of the rail passengers are highly dissatisfied of the service. It shows that the level of passenger satisfaction towards rail transportation is in a better position than the bus transportation and it is important to identify and take necessary actions to improve the service quality in order to retain the number of passengers using the public transportation service.

It was founded that the purpose of travel affect the bus passenger satisfaction level and majority of the respondents who travel for all the purposes including working, studying and personal activities have rated the satisfaction towards the service quality as neither satisfied nor dissatisfied, however for many service quality attributes the rating has been dissatisfied by the majority, which has to be taken in to consideration in developing the bus transport service.

Most of the bus passengers are satisfied of the bus fare whereas it is important to understand the reason for certain service quality attributes such as the use of travel cards were rated as highly dissatisfied. Major reasons would be the lack of technology utilization by the relevant authorities and the lack of knowledge among the general public on utilization of technological concepts such as travel cards.

It was founded from the analysis that the gender affects the level of passenger satisfaction towards the rail transportation service and majority of the males have responded as the level of satisfaction as neither satisfied nor dissatisfied and majority of the females have responded the rail service as satisfactory. It is important to understand that majority of the service quality factors were rated as either satisfied or neither satisfied nor dissatisfied which shows that passengers have a better perception towards the service quality of rail transport service. Through proper identification of the service quality factors that need to be improved and improving them and specially increasing the frequency of operation can make a positive impact on the passenger satisfaction towards the service quality in rail transportation service.

However it was understood that service quality of Public transportation should be improved in order to make a positive impact on the level of passenger satisfaction towards the service quality of public transportation in Sri Lanka. End result would be a major solution for the congestion problem which Sri Lanka is currently facing in almost all the urban areas in the country including Colombo.

B. Recommendations

Study reveals that the Public Transport users are dissatisfied of the frequency of operation of both the bus and train service to a particular route, therefore the operation frequency should be increased as well as the number of trains and buses operated during the peak hours should also be increased.

Majority of the population has responded as highly dissatisfied regarding the use of travel cards which may be due to the lack of technological knowledge among the public in utilizing them. Use of Travel cards should be promoted which will be more efficient and effective as well as it will result in elimination of issues related to the bus fare.

Study also shows that the public has a negative perception regarding the comfortability inside buses and trains and the crew employed in Public Transport service. For a better service comfortability inside the buses and trains should be improved as well as qualified and trained crew must be employed. Results show that Public Transport users are highly dissatisfied of the travel times, which should be avoided through the impose of strict regulations and operation on properly managed schedules.

Based on the study, authors' perception and suggestions obtained from the respondents' technology approaches need to be adopted in development of transport infrastructure, number of train compartments need to be increased as well as behaviour of staff need to be improved with more responsiveness for a better Public Transportation service.

C. Limitations of the study

Study was mainly based on the information given by the sample respondents which were subjected to beliefs and attitudes of different individuals. Number of respondents has been limited to 300 due to time and economic constraints in conducting the research. Data was collected mainly from 5 main selected locations (Pettah Railway Station, Pettah, Malabe, Badulla and Anuradhapura Bus Stands) due to time constraints and

it was performed from 8-10 am in the morning and 3-5 pm in the afternoon. Due to different mindsets of the individuals the suggestions given for the improvement of the Public Transport Service are not constant.

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