DETERMINANTS OF PASSENGER SATISFACTION USING PUBLIC TRANSPORT SYSTEM IN COLOMBO: A CASESTUDY ON KOTTAWA – PETTAH ROUTE

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Degree of Master of Science in Business Statistics

Department of Mathematics

University of Moratuwa
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DECLARATION OF THE CANDIDATE AND SUPERVISOR

I declare that this is my own work and this dissertation does not incorporate without acknowledgement any material previously submitted for a Degree or Diploma in any other University or institute of higher learning and to the best of my knowledge and belief it does not contain any material previously published or written by another person except where the acknowledgement is made in the text.

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The above candidate has carried out research for the Masters Dissertation under my supervision.

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ABSTRACT

This research intends to identify the determinants of passenger satisfaction using the public bus transport system on Kottawa – Pettah Route in Sri Lanka. Data were collected from a structured questionnaire and the sample size is 400. The sampling method was stratified random sampling and a sampling unit is a passenger boarding from the Kottawa bus stand during November 2019. The Factor analysis (FA) was carried out to derive the inferences of the study. It was found that the observed data satisfied all the necessary requirements for FA. Fifteen factors identified as the determinants of satisfaction of passengers using Kottawa – Pettah Route. In view of the above, it is recommended to strictly implement the current laws and regulations, design new laws and regulations, train bus crew, introduce new innovative methods to improve the satisfaction of the passengers using public bus transport system. This will also result in protection and enhancement of the interests of passengers, other road users, drivers, conductors, operators and other stakeholders of public bus transport system in Sri Lanka.

Key words: *Factor analysis, Satisfaction of passengers, Public bus transport,*

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LIST OF ABBREVIATIONS

Abbreviation	Description
BRTS	Bus Rapid Transport System
CAGR	Compounded Annual Growth Rate
CGR	Ceylon General Railway
CTB	Ceylon Transport Board
DW	Durbin–Watson
EFA	Exploratory Factor Analysis
FA	Factor Analysis
GDP	Gross Domestic Product
KMO	Kaiser-Meyer-Olkin
MSM	mean squares for the model
MSR	mean squares for the residuals
OLS	Ordinary least squares
PCF	Principal Component Factoring
SLTB	Sri Lanka Transport Board
SSM	Model sum of squares
SSR	Sum of squared residuals
SST	Total sum of squares

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CHAPTER 1

INTRODUCTION

1.1 Transport Systems in Sri Lanka

Transport broadly categorized into land, water and air transport. Transport system in Sri Lanka primarily consists road and railway transport. Contribution of road transport for the movement of passengers is relatively very high compared to rail passenger transport. This has resulted in road passenger transport becoming the principal mode of public transport in Sri Lanka. Road passenger transport includes public buses, private cars, three wheelers, dual purpose vehicles and motor cycles.

Road transport system includes toll roads, highways (A Grade Roads), B, C and D Grade roads and other small access roads. Road network of Sri Lanka covers all corners of Sri Lanka, where human habitats live, except for islands, where ferries are used for transportation. Proper road system to Sri Lanka was introduced during the Colonial era for the purpose of transporting spices and security purposes. Toll roads were introduced to Sri Lanka in the mid of last decade.

Railway transportation also introduced to Sri Lanka during the Colonial era. Anyhow, railway transport system does not cover all parts of Sri Lanka. It covers most of the major cities in Sri Lanka. Rail transport network has not been improved after independence, except for the construction of Matara – Kataragama railway line.

Sri Lanka is an island, covered by the Indian Ocean, and has several rivers; passenger transport by way of air and water is very limited. In the recent past, only domestic air transport is opened for the public. Now only, the government and the private sector focus on developing domestic air and water transport modes.

1.2 Public Transport Systems in Sri Lanka

According to ownership and operation of public buses, three distinct periods can historically be seen; exclusively private sector from 1907 to 1957, exclusively State sector from1958 to 1978, and mixed operations after 1978 (Kumarage, 2002). Ceylon Transport Board (CTB) and Ceylon General Railway (CGR) had been the forefront supplier of public transport till 1979, after liberalizing the economy through economic reforms since 1979, private sector has become the major force in public transport system in Sri Lanka. Accordingly, private sector institutions and individuals have been increasingly providing the public transport service. Currently, private sector, Sri Lanka Transport Board (SLTB), formally CTB, and CGR provide public transport service in Sri Lanka. Though, the government and private sectors provide public transport, it has several problems. However, the co-existence public and private transport service providers are essential for the development of transportation sector in Sri Lanka.

Kumarage (2002) noted that no material improvements have been made to develop the public transport system in Sri Lanka. This finding is still valid; except for expanding the road network and increasing the number of route permits, no material improvements have been made to develop the public transport system in the recent past. Public transport system in Sri Lanka has several problems; including low supply of public buses and trains, less infrastructure, not following road rules, weak regulations, not enforcing available laws, non-trained crew, low satisfaction of passengers and other road users. Public transport system has been under criticism of all stakeholders, including passengers, other commuters, co-drivers, regulators, legal enforcement agencies and general public as a whole.

In the recent years, use of more private vehicles with low occupancy, violation of traffic rules, non-availability of adequate roads, increase in passengers, construction of roads, vehicle accidents, time wasted on roads have been gradually increasing at an alarming rate. The use of private vehicles also reduces the demand for public transport, still for all availability of public transport is not sufficient to meet the current demand.

Research on satisfaction of passengers using different modes of transport; bus, train, taxis, aero planes and ships, has been studied in developed, developing and less developed countries, including rural and urban areas (Fellesson & Friman, 2008; Cantwell et.al.,2009; Dell'Olio et.al., 2010; Castillo & Benitez, 2012; Aidoo et.al., 2013; Das et.al., 2013; Fiorio et.al., 2013; Jainet.al.,2014;Ikhlaqet.al., 2017; Jan et.al., 2019). Similarly, studies were conducted on satisfaction of passengers in Sri Lanka as well in different contexts (Liyanage et.al., 2008; Chandrakumara 2014; Chandrakumara & Pathmini, 2015;Ranawana & Hewage, 2015; Kanishka et.al., 2015; Wijerathna, 2016; Randiwela & Jayaweera, 2017; Danthanarayana, 2019). Further, the research covers the satisfaction of passengers using Kottawa – Pettah bus route only. This study does not cover the satisfaction of passengers using all modes of transport, and it does not cover the satisfaction of passengers using other bus routes.

1.3 Recent Trends in Public Transport in Sri Lanka

Providing high quality modern transport services to satisfy passengers have become a major concern among policy makers, transport institutions, and researchers. Sri Lanka has been witnessing a rapid increase in economic activities after the end of the civil war nearly a decade ago. To support this, growth of GDP over the years is shown in n Figure 1.1.

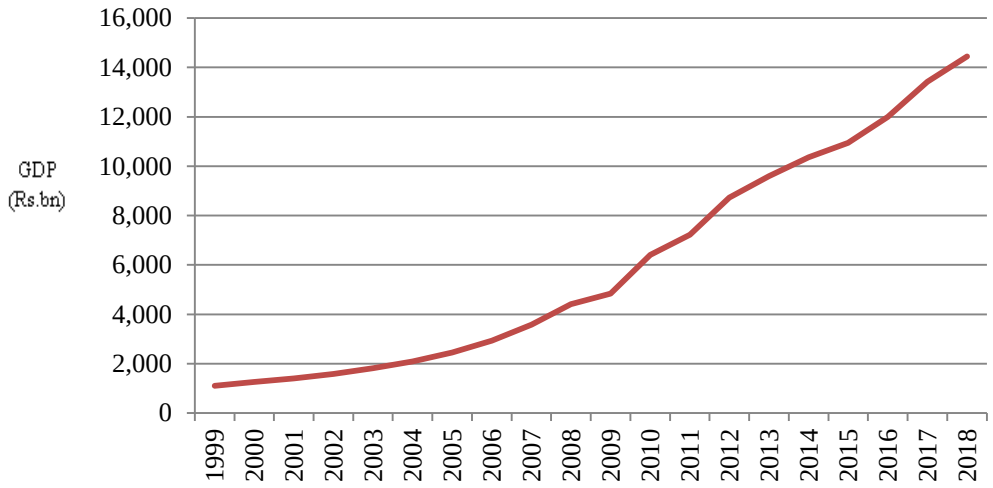

Figure 1.1: GDP at Current Market Prices (Rs. bn)

The number of registered buses and other motor vehicles from 2009 to 2018 is shown in Table 1.1.

Table 1.1: Growth of vehicles in Sri Lanka

Year	Registration of Buses	Registration of Other Motor Vehicles	Total New Registration of Motor Vehicles
2009	739	203,336	204,075
2010	2,491	356,752	359,243
2011	4,248	521,173	525,421
2012	3,095	394,200	397,295
2013	1,805	324,846	326,651
2014	3,851	425,705	429,556
2015	4,140	664,767	668,907
2016	2,685	490,643	493,328
2017	3,331	448,322	451,653
2018	2,957	477,842	480,799
Total	**29,342**	**4,307,586**	**4,336,928**
% Contribution w.r.t. total	0.68%	99.32%	100

The higher number of private and public transport vehicles on the roads in Sri Lanka reflect the higher demand for passenger transport. Further, the share of other vehicle (except buses) registration was more than 99% of importation of vehicles. On the other hand, importation of buses accounted for 0.68% only. From the above fact, it can be derived that passengers may be moving from conventional public bus and train services to privately-owned and hired vehicles, as public transportation may not be able to fulfil passengers' expectations. During 1991-2011 period, share of passengers using public transport reduced by seven per cent, on the other hand, share passengers using private vehicles increased by the same seven per cent. Though, new registration of buses was less than one per cent, increase in bus registration during last decade was three folds compared to prior to 2010 period. This reflects the increased demand for buses mostly driven from public bus transportation.

Growth and development of a country depend on the development of its infrastructure as well. Specially, the quality and availability of transportation facilities contribute immensely to the growth and development of a country. As it moves factors of production and finished goods from places of excess supply to places of excess

demand. This transfer of factors of production and finished goods improve the efficient operation of the whole economy. Contribution of Transport Sector to the Economy is shown in Table 1.2.

Table 1.2: Contribution of Transport Sector to the Economy

Year	GDP at Market Prices[a] (Rs. Mn)	Transportation of Goods and Passengers including Warehousing[a] (Rs. Mn)	Per cent Contribution of the Transport Sector[b]	Real GDP Growth (%)
2014	8,235,429	885,506	10.75%	5.0
2015	8,647,833	931,529	10.77%	5.0
2016	9,035,830	982,703	10.88%	4.5
2017	9,344,839	1,013,792	10.85%	3.4
2018	9,644,728	1,042,173	10.81%	3.2
CAGR[b](%)	4.03	4.16		

Transportation sector contributes a significant above 10% to the gross domestic production of Sri Lanka. Further, both the economy and transportation sector have been growing at an average compounded annual growth rate of four per cent during last five years (Central Bank of Sri Lanka, 2018).

Increased service quality, in other words, higher satisfaction of passengers leads to higher use of public transport, instead of other modes of transport. Further, Sri Lanka has been growing as a most sought-after tourist destination. In order to attract and retain foreign tourists, it is essential to have good public transportation system as well (Le-Klähn, 2013).

Urban cities like Colombo and its suburbs, and Kandy are facing huge road traffic congestion especially during peak hours. Some reasons for traffic congestion are non-availability of sufficient public transport facilities, dissatisfaction of passengers over public transport facilities, centrally locating government and private offices, schools, similar office opening and closing hours, insufficient road space, use of private vehicles with low occupancy, violation of road rules, structural deficiencies of the roads, conducting businesses on the roads and pavements, non-availability and inadequacy of pavements, inconsistent government policies, unplanned city

developments, rural to urban migration of population, and economic growth and development.

This results in wastage of higher number of human hours on roads unproductively and economic losses, higher private cost on energy, vehicle accidents, carbon dioxide emission to the environment, and other related negative externalities. Therefore, it is essential to introduce sustainable modes of transport replacing the use of private vehicles (Dell'Olio et.al., 2010).

Able passengers, with lack of satisfaction (or dissatisfaction) on public transport, lead to the use of private vehicles, even at higher social and private cost. Therefore, it is essential to find the attributes, which are the reasons for dissatisfaction of passengers in using public bus transport and overcome such weaknesses consistently and continuously.

1.4 Description of Kottawa – Pettah Route

Colombo city, the commercial capital of Sri Lanka, connected with the rest of the country through five main roads; Colombo – Kandy Road (A1), Colombo – Galle Road (A2), Colombo – Negambo road (A3), Colombo – Wellawaya – Batticoloa road (A4) and Colombo – Awissawela (Old) Road (A5). These five roads have similar traffic conjunction, resulting more than one hour of travelling time during off-peak hours and more than two hours during peak hours to reach the first 20 Kilometers.

Kottawa-Pettah Road is the starting 23 Kilometers road on the A4 highway (Colombo – Wellawaya – Batticoloa Highway), which connects the capital city (Western part) with the Eastern Sri Lanka. The bus route is from Pettah, through Union Place, Town Hall, Cinnamon Gardens, Thummulla Junction, Thimbirigasyaya, Kirulapone, Nugegoda, Gamsabaha junction, Wijerama, Nawinna, Maharagama and Pinnipitiya, to Kottawa. Throughout the road, it has at least one lane on each direction. The bus route number of Kottawa – Pettah route is 138. All buses running on this route are two-door TATA or Lanka Ashok Leyland buses. Both private and CTB buses operate on this route. However, operation of CTB buses is very limited. Other route buses

operating from Pettah to Homagama, Padukka, Ingiriya, Awissawela, Rathnapura, Badulla, Embilipitiya, among others, also operates along this route.

1.5 Current Situation

Research on the determination of passenger satisfaction is performed in developed and developing world and resulted in finding weaknesses of the current system, and implementation of recommendations have yield positive results (Aidoo et.al., 2013; Cantwell et.al., 2009; Castillo & Benitez, 2012; Dell'Olio et.al., 2010; Fellesson & Friman, 2008; Fiorio et.al., 2013; Le-Klähn et.al., 2014; Murambi & Bwisa, 2014; Ngatia et.al., 2009; Noor et.al., 2014).

When improved public transportation is available, private car users, three wheel users and motor cycle users to a certain extent will reduce the use of private vehicles and switch to public bus transport. This will lead to positive externalities to the economy, in terms of less time wastage on roads, less carbon emission, less private cost, higher profits for the bus owners and less accidents.

1.6 Significance of the Study

Satisfaction of people leads to happiness. This thesis will be a useful instrument to find the shortcomings of the current public bus transport system and to make recommendations to respective government agencies to enhance the quality of passenger bus service. Findings and recommendations of this research may be helpful for the Government agencies to prepare an action plan on the future of public bus transport service in terms of satisfaction of passengers. Findings of the research can be useful to reduce passengers shifting from public transport to other modes of transport due to lower satisfaction or dissatisfaction on public bus transport. Finally, understanding the satisfaction of passengers is important, as if passengers can afford, they may switch to other modes of transport increasing negative externalities and reducing the overall profitability of the public bus service sector.

1.7 Objectives of the Dissertation

In view of the above explanations, the research objectives are

i to identify the factors affecting the satisfaction of passengers in public transport system, and

ii to provide some recommendations using a case study on the factors affecting the satisfaction of passengers in public bus transport system.

1.8 Outline of the Dissertation

The thesis is organized with six chapters as follows. Chapter 1 provides the introduction to the thesis. Chapter 2 provides the literature review, while materials and methods are detailed in Chapter 3. Chapter 4 explains the exploratory data analysis. The empirical results are explained in Chapter 5. Finally, Chapter 6 concludes the thesis with recommendations to improve the public bus transport.

CHAPTER 2

LITERATURE REVIEW ON THE SATISFACTION OF PASSENGERS USING PUBLIC TRANSPORT

This chapter provides literature on the satisfaction of passengers using public transport and related work carried out by various researchers. This chapter is divided in to four sections; satisfaction of passengers using public transport in developed countries, developing African countries, developing Asian countries and Sri Lanka. Special reference is given to the research on the satisfaction of passengers using public transport in developing countries.

2.1 Satisfaction of Passengers using Public Transport in Developed Countries/Regions

Studies on satisfaction of passengers using public transport is not a new phenominan in developed countries. Several studies have been performed on the subject for a long period of time (Fellesson & Friman, 2008; Fiorio et.al., 2013; Le-Klähn, et.al., 2014; Le-Klähn D.-T., 2013). Fellesson & Friman (2008) studied the passenger satisfaction in nine European cities; Stockholm, Barcelona, Copenhagen, Geneva, Vienna, Berlin, Manchester, Oslo and Helsinki. using 9,542 passengers on 17 statements of attributes related to local public transport systems. This study used data from Benchmarking in European Service of Public Transport, 2006. Initail solutions were obtained using principal component analysis and eigenvalue greater than or equal to one is used to select the number of factors to be kept in the model. It was found using factor analysis, with varimax rotation, that systems, comfort, staff and safety were the dominant factors influencing passenger satisfaction in seven cities; Copenhagen, Geneva, Vienna, Berlin, Manchester, Oslo, Helsinki. However, in Barcelona, the primary factors were safety, system and staff and in Stockholm, those were safety, system and delivery.

In additon, Fiorio et.al., (2013) studied the passenger satisfaction and the organization of public transport service in 33 cities; Palermo, Napoli, Roma, Verona, Torino, Bruxelles, Marseille, Berlin, dublin, Essen, Lisboa, Barcelona, Málaga, Bologna, Braga, Graz, Liège, London, Madrid, Belfast, Cardiff, Paris, Glasgow. Muenchen, Antwerpen, Lille, Newcastle, Leipzig, Hamburg, Bordeaux, wien, Strabourg, and Rennes, of nine European countries; Belgium, Germany, Spain, France, Ireland, Italy, Portugal,United Kingdom and Austria. 500 samples were collected from each city and standard probit model is used for the analysis. The results found indicates that passengers were more satisfied with the markets with single player, as against the markets with more than one passenger transport operator. In terms of number of samples and coverage across Europe, this research is better than others.

Cantwell et.al., (2009) conducted an online survey of 324 employees commute daily by bus and rail into Dublin to examine the determinants of satisfaction of passengers using public transport. Research used chi-squared tests and multinomial logit model. Passengers travelling by crowded or unreliable services and have waited long times have lower satisfaction. As Multinomial logit model found that crowding has positive and reliability has negative impact on utility derived. Reliability is measured using three levels; travel time is standard for all trips, travel time can vary by up to 15 minutes, travel time can vary by up to 30 minutes. Crowding has three levels; seats available, standing room only, not getting at least one service due to overcrowding, and the vehicleis at crush capacity when boarding. They claimed that crowded public transport service, unreliable public transport services and waiting time result in stress to passengers. Both satisfactory and unsatifactory factors are the same for both bus and rail.

Le-Klähn (2013) studied the satisfaction of 380 tourists visited Munich during April – May, 2012 using principle component analysis with Varimax orthogonal rotation method. The results found four principal components (diamentions) with eigenvalue more than one; comfort (including space on vehicle, cleanliness of the vehicle, seat availability, comfort while waiting at stops or stations and safety on board), services (including punctuality, reliability, service frequency, convenience of the time table

and network connection), accessibility (including accessibility to the bus stops and train stations, accessibility to the vehicles), and others (ticket price, ease of use, staff service and information).

Le-Klähn et.al., (2014) analysed the satisfaction of public transport in Munich, Germany, using data collected from 380 responses of tourists to the 17 aspects of self administered survey. This study used descriptive analyais (mean, median and mode) and Factor analysis (principal component factoring and Varimax orthogonal rotation) to delineate the underlying diamentions that were related to the satisfaction of passengers. The factor analysis, with selecting eigenvalue greater than or equal to one and factor loadings greater than 0.5,found four diamentions of visitor satisfation; (i) travelling comfort (includes space on vehicle, cleanliness of the vehicle, seat availability, comfort of stations and safety on board), (ii) service quality (includes punctuality, reliability, service frequency, convenience of the time schedule, and network connection), (iii) accessibility (includes accesability to stations and vehicles) and (iv) additional features (include ticket price, ease-of-use, staff service, and information). Further, it was also found that visitors were generally satisfied with a mean of 4.68 of 1 to 5 likert scale,with public transport systems in Munich and the level of satisfaction is independent of most selected factors. Further, descriminant analysis found that six variables;cleanliness of the vehicle, information, ticket price, space on the vehicle, service frequency and ease of use, were most important to visitor satisfaction in Munich.

Mouwen (2015) studied the satisfaction of passengers using bus, tram, metro and regional trains in urban and regional Netherlands using 180,000 responses during 2010 and 2011. It was found that the satisfaction levels of passengers depends on passenger characteristics, situational conditions and experiences. As a whole, it is also found that travel speed, on-time performance and bus frequency are more important aspects than crew behaviour and vehicle neatness.

Castillo & Benitez (2012) tried to model user satisfaction matters in public transport systems employing user 1508 responses to survey in Bilbao, Spain. Survey consisted

of 35 questions (factors) on eight different aspects of public transport. The answers were with a likert scale from 0 to 10. In order to achieve this objective, it used three distinct statistical methods; models based on averages, generalized linear model and a model based on multivariate discrete distribution. It was found that of 35 factors, only five factors are very relevant. This research is distinct due to the use of three statistical methods to examine the robostness in modelling passengersatisfaction.

2.2 Satisfaction of Passengers using Public Transport in Developing African Countries

Aidoo et.al., (2013) used a cross-sectional survey of 500 randomly selected passengers to study the passenger satisfaction in Ghana. This study used thirteen service components and binary logistic model. The results found that bus safety record is the prime influential service component and fare level and crime rate at bus station are also other influential factors in determining passenger satisfaction in Kumasi-Accra route in Ghana. More than 70% of passengers rated service quality as good or excellent, and only one per cent of the passengers rated the overall service quality as poor. This research used binary logit model by reducting the levels of service quality to two. If mulitinomial model also used without reducing the levels of service quality to two, and results are reported and compared with the results of the binary logistic model, the research would have further improved.

Ojo et.al., (2014) citing that Aidoo et.al., (2013) used adhoc attributes, employing SERVQUAL model with five diamentions comprising 26 attributes researched the passenger satisfaction in Cape Coast–Accra route in Ghana. This study selected 162 systematic samples with self administered questionnaires found that two diamentions and 15 attributes influenced perception of service quality resulting dissatisfaction of passengers. Compared to Aidoo et.al., (2013), Ojo et.al., (2014) used less sample (less than one third), however, in terms of number of attributes Ojo et.al., (2014) is higher.

Murambi and Bwisa (2014) used administered semistructured questionnaire and interviews of 310 passengers to examine the service quality and customer satisfaction among shuttle travellers in Kitale Terminus, Kenya. It is found that travel time,

punctuality, clear information, good staff behaviour, and assured on board security determine the passenger satisfaction.

A research on satisfaction of passengers on intra-city public bus transport service in Abuja, Nigeria, collected 300 responses to questionnaire and used principal component analysis, field observations and oral interviews. It was found that passengers were not satisfied with the public transport service in Abuja. The results using principal component analysis found that comfort in busses, accessibility to bus transport services, bus stop facilities and adequacy of bus capacity determine the satisfaction of passengers (Nwachukwu, 2014). Adebambo and Adebayo (2009) also using 100 samples from self-administered questionnaire and chi-square tests, researched the effect of bus rapid transport system (BRTS) on passenger satisfaction in Lagos. It was found that less than half of the passengers were satisfied and some passengers were very dissatisfied with BRTS.

A research on the passenger satisfaction on urban public transport service was performed in Nairobi, Kenya by using 25 perceived preferences collected from 140 responses to the questionnaire. It was found using structural equation modelling that service quality, safety, travel cost and the perception on the services' performance were the significant determinants of the satisfaction of passengers on public transport in Nairobi (Ngatia, Fumihiko, & Toshiyuki, 2009)

2.3 Satisfaction of Passengers using Public Transport in Developing Asian Countries

Shaaban and Khalil (2013) studied the customer satisfaction of public bus service in Qatar by issuing 500 adminstered questionnaires. Only 278 forms (55.6%) were complete and taken for the research and the balance had more than 30% missing values, resulting disregading those responses. Structutal equation modelling was used as the statistical method. It was found that (i) low income category is the main users of public bus transport, resulting other categories of population apart from public bus service, (ii) female passengers and students do not use public buses in Qatar, (iii) public bus service primarily serves the expatriate community, and (iv) passengers noted that bus service was not very dependable, however, it was affortable and clean.

Putra et.al., (2014) researched the passenger satisfaction of public transport in urban areas of Indonesia using structural equation modelling. The results show that service quality of public transport was low, and accessability, integration, capacity timeliness and comfortableness of the public transport have to be improved. This research did not provide the method of sampling and data collection, further, the location where the study was conducted was not clear. If these were included, it would have improved the research and it is easy for the user to understand.

Noor et.al., (2014) examined the determinants of customer satisfaction on city bus service in Kota Kinabalu, Malaysia using factor analysis of the 987 responses to the survey questionnaire. Accordingly, three factors: comfort, accessibility and safety, were found to be dominant factors determining passenger satisfaction with eleven (Bus on time, Bus information, Short waiting time, Bus schedule available, Easy to switch buses, Good coverage, Easy to get a bus, Bus in good condition, Clean bus, Air Condition and Convenience for elderly/disabled), five (Convenient fare, Cheap fare, Easy access to bus stop, Bus in good condition and Comfortable music)and four (Feel safe during night, Friendly driver, Feel safe on the bus and Efficient driver) items representing each factor. Two noteworthy points of this study are that it used a sample of 987 responses and compared the satisfaction levels of passengers on mini bus and transit bus services.

Das et.al., (2013) researched the satisfaction of the passengers of monorail in the Kuala Lumpur City, Malaysia using 400 responces based on Taro Tamane random sampling. Important Performance Analysis (Quadrant Analysis) was used to measure passenger perceptions and priorities to decide the improvements to be made to the current systems of monorail system in Kuala Lumpur. It was found that the passengers of Monorail system are rather satisfied with the service. However, it was also recommended to (i) improve waiting area, (ii) build more escalators, (iii) increase the numbers and standards of seats, (iv) increase the number of routes, (v) increase parking factilities and transport to suburbs, and (vi) improve comfort during boarding at peak hours.

Ikhlaq et.al., (2017) studied the user perceptions on performance of intercity bus terminals in Lahore, Pakistan using six performance indicators; safety & security, access, information, connection & reliability, environment and allied features. It was found that (i) performance of privately owned bus terminals perform better than that of government owned ones, (ii) passengers rated safety and security as most important factor among six performance indicators, and (iii) no standard regulations and guidelines are available for bus termianls. Accordingly, it was recommended to (i) design and develop bus terminals after obtaining views of the passengers as well, (ii) introduce park-and-ride facilities, (iii) integrate urban public transport with intercity services, (iii) introduce on-line ticketing services, (iv) display bus time table on a website, and (v) amend Motor Vehicle rules of 1969.

Javid et.al., (2015) studied the passenger satisfaction on public bus transport facility using 631 survey responses in Lahore, Pakistan. This research used factor analysis and structural equation modelling together to study passenger satisfaction. Symbolic, functional, and cost and time factors have significant and positive effect on passenger satisfaction, (ii) condition of the bus stop, and ticket and facre collection system have positive impact on passenger satisfaction, (iii) extracted three factors; Symbolic, functional, and cost & time, positivelycorrelated with each other, car oriented strata has low satisfaction regarding service quality, and non-motorized strata is highly satisfied with majority of service attributes, except for transport cost. Therefore, it is recommended to (i) reduce transport cost to attract more passengers, (ii) increase route coverage and frequency of travel, and (iii) improve symbolic and function attributes to attract more female passengers.

Jan et.al., (2019) using 429 responses to questionnaire in Peshawar, Pakistan studied the passenger satisfaction in using public transport. Probit regression method is used to analyse collected data, as user satisfaction is measured in binary form; Yes/No. It was found that quality of vehicles, cleanness of vehicles, availability of seats, driver skills, route characteristics, waiting time, time taken to reach destination, regulatory services and frequency of service have significant and positive impact on passenger

satisfaction in Peshawar. Other variables; comfortability of seats, shelter & benches, fare charges, behaviour of conductors, journey time and driver's skills were found to be not statistically significant in explaining passenger satisfation.

Irfan et.al., (2012) studied the service quality of rail transport among the users of long distance trains from Lahore to Karachi, Multan, Peshawar and Rawalpindi, Pakistan. The study used modified SERVQUAL model with eight attributes; empathy, assurance, tangibles, timeliness, responsiveness, information system, food, and safety & security.These eight service constructs included 31 variables. Structural equation modelling found that dissatisfaction against allattributes of service quality, except for tangibility. However, it was found that tangibility resulted in satisfaction of passengers. Accordingly, it was recommended to make a total turnaround of long distance railway transport system in Pakistan.

Vishnuvarthan and Selvaraj (2012) used structured questionnaire with 35 questions to measure the satisfaction level of passengers and 25 statements to identify the awareness of passengers on the services offered by the Indian Railways. The study used 500 responses and'F' test and 'Z' test to measure the satisfaction of passengers of the Indian Railways. It was found, using chi-square, that (i) 84 per sent of passengers were dissatisfied with the serivces of Indian Railways, (ii) 76% of passengers had low level of awareness of the services offered by the Indian Railways, and (iii) knowledge of passengers on the services offered by the Indian Railways have significant rationship with the level of satisfation of passengers.

Gunaseelan (1995), using 300 samples from State and private sector bus operators each, found that (i) passengers are more satisfied with State sector bus operators than the private sector bus operators in North Arcot, Tamil Nadu, India; (ii) passengers of State sector buses were more satisfied with punctuality and reliability than safety and regularity, however, passengers of private sector buses were more satisfied with comfort compared to State sector buses; and (iii) with respect to crew behaviour and social responsibility, both operators were rated the same.

Jain et.al., (2014) researched the criteria passenger use when shifting their mode of travel from private vehicle to public transport in Delhi; including all nine districts; North, Northeast, East, South, Southwest,West, Northwest, Central and New Delhi. 500 samples were collected from 50 locations, representing nine districts, using stratified random sampling method. Analytical Hierarchy Process, the multi attribute decision making method, was used to order options from the most preferred to the least preferred options. Accordingly, it was found that (i) safety as the prime characteristic (36%) motivating urban passengers to shift passengers from private vehicles to public transport, (ii) reliability (27%), cost (21%) and comfort (16%) for encouraging the urban commuters to shift from private vehicles to public transport, (iii) passengers in Delhi were satisfied with metro services compared to other modes of public transport due to safety, adherence to schedule, less travel time, frequency, and comfort, (iv) as cost was not considered as an important characteristic, passengers were willing to pay more for better public transport service. It was also very necessary to note that 96% of passengers were willing to shift to public transport if above characteristics were fulfiled.

Maldar & Sakhalkar (2020) studied the satisfaction status of passengers, mainly students, using Maharashtra State Road Transport Corporation in Pune, Maharastra, India. Data were collected from 523 usable responses using a structured questionnaire. Analysis was done using tabulation. It was found that (i) marginaly more than half of the sample is not satisfied with the current serivce, (ii) 69% and 59% of passengers were not satisfied with availability and maintenance of toilets/bathrooms in bus terminus, (iii) passengers were positively satisfied with 24 attributes of the 33 attributes questioned, and (iv) accordingly, recommendations were made to improve the service. Maldar & Sakhalkar (2020) is similar to Wijerathna (2016) in terms of selection of samples, as both used students as the prime respondents to structured questionnaire. However, if Maldar & Sakhalkar (2020) used a sofisticated statistical tool, instead of tables, the results would have improved further.

2.4 Satisfaction of Passengers using Public Transport in Sri Lanka

Few researches on the satisfaction of passengers using public transport is performed in Sri Lanka (Liyanage et.al., 2008; Chandrakumara, 2014; Chandrakumara & Pathmini, 2015; Danthanarayana, 2019; Kanishka et.al., 2015; Ranawana & Hewage, 2015; Wijerathna, 2016). These reseach also conducted on railway passengers, semi-luxury bus passenger, luxury bus passengers, students and urban dwellers. Hense, it does not cover the normal bus passengers. Normal buses are the prime transport mode and available through out the country compared to luxury buses and trains. Further, majority of passengers use normal buses instead of semi-luxury and luxury buses.

Liyanage et.al., (2008) collected data from 120 households from the Mattegoda housing scheme (sub-urban), Kottawa, and 121 households from Kudaligama (rural), Mathugama. Figures and tables were used as tools for the analysis. The research found that longer waiting time and longer travel time during off-peak hours, overcrowding during peak hours, anti-social behaviour of drivers and conductors, higher noice levels, unacceptable and inadequate passenger comfort, lack of night service, and lack of passenger rights are the reasons for dissatisfied passengers using public bus transport in Sri Lanka. It was noted that the main reason for the above was not having asuitable demand and supply management model to satisfy both passengers and operators. It was also emphasised that these factors may differ between urban and rural areas. Accordingly, it was recommended to empower the passengers of public bus transport service.

Kanishka et.al., (2015) studied the satisfaction of passengers using luxury long distance SLTB bus service between Maharagama and Galle through the Southern expressway. This service was introduced as an improved alternative to the present low quality public bus service. This research was done using a survey questionnaire distributed at Galle and Maharagama to the waiting passengers. Little more than 75%, 150 responses were eligible for the analysis from the 194 questionnaires distributed. Research classified respondents into two groups based on the perception on bus fare, as *"too pricy and fair fare perception groups"*. This research used independent t-tests and one way ANOVA, and found that the first group reflects low satisfation relative

to the second group and it is determined by the passengers'previous modes of transport. It is also concluded that reasonable bus fare is charged relative to the service provided and the lower satisfaction is due to the characteristics of the bus terminals. Accordingly, Kanishka et.al., (2015) recommended to improve the chracteristics of the terminals and increase the number of bus stands on the normal roads to increase passenger satisfaction. This study is about long distance luxury expressway (toll roads) bus users, it does not include mostly used short distance, normal buses, running along normal roads.

Chandrakumara (2014) studied the urban dwellers' satisfaction on public bus transport to identify the main service elements and aspects in deciding passenger satisfaction in urban passengers. 360 samples were collected from Navinna Grama Niladary Division of the Maharagama Divisional Secretariat Division of the Colombo District in Sri Lanka. Chandrakumara used factor analysis to find 17 service elements; mainly professionalism and service delivery qualities, out of total 33 elements, as important areas in determining passenger satisfaction in using public transport. Accordingly, scare resources may be directed to collect data on these 17 elements to determine passenger satisfaction instead of collecting data on 33 elements, and resources shall be directed towards improving these 17 elements. Special features of Chandrakumara (2014) are that it did not collect sample from a particular bus route, instead, it focused on urban passengers and the sample size is relatively higher compared to Kanishka et.al., (2015).

Danthanarayana (2019) researched the satisfaction of passengers using semi-luxuy bus service along the Panadura-Kandy Route (Route No. 17), inter-Provincial long distrance bus service, in Sri Lanka. 100 samples were randomly selected at Panadura, Nugegoda and Kaduwela. Ten quality aspects; fare, cleaness, comfort, condition, discipline, travel time, loading level, privacy, availability, and safety, were selected to study the passenger satisfaction on this route. According to the current transport regulation semi-luxury buses should not load more than the seating capacity of the bus. This research used Ordered Logit model to test the level of passenger satisfaction. However, it was found that passengers on this bus service is dissatisfied,

mainly due to loading level during the journey. Ordered Logit model found that comfort, fare, loading, privacy, availability and safety have statistically significant relationship with satisfaction of passengers. Hence, Danthanarayana (2019) recommended to increase the availability of semi-luxury bus service on this route and enfore the current regulations properly.

This reseach used less samples compared to Kanishka et.al., (2015) and Chandrakumara (2014). Further, the sample also selected only from the first 20% of the whole bus route, this drawback question the representativeness of the sample, as a result, the validity of findings as well. Chandrakumara (2014) and Danthanarayana (2019) studied the satisfaction of passengers using the same bus route (No. 17), however, found different results, mainly due different bus service, namely; normal and semi-luxury bus service.

Wijerathna (2016) collecting data from 100 users, who use public bus transport, of SANASA Campus, Kegalle, studied the satisfaction of passengers using public bus transport service. Resarch used five point Likert scale stuctured questionnaire to collect data on satisfaction of passengers using public bus transport. ANOVA and regression analysis are used as statistical methods to study passenger satisfation in using public bus transport.

Randiwela & Jayaweera (2017) studied the attitude of tourists towards railway transport system in Sri Lanka using nearly 40 samples from each station from Colombo Fort, to Galle, Hikkaduwa, Kandy, Nanu Oya and Badulla. 265 responses were received from tourists with English knowledge. It was found that (i) tourists above 30 years age are comparatively highly satisfied, (ii) overall satisfaction of all age categories is above 50%, (iii) demographic factors have no influence on satisfaction level, (iv) duration of stay does not have any impact on satisfaction, (v) tourists are not satisfied with the facilities at the railway stations and females are more concerned on this aspect, (vi) all tourists rated fare as cheap, and (vii) refreshment availability and language skills of railway staff have negative impact on satisfaction.

Ranawana and Hewage (2015) using descriptive analysis, chi-square analysis and multinomial logistics regression analysis, using vehicle safety, physical design of station, physical quality of vehicle, time table information, travel time/delay, frequency of departures, ticketing system, fare level, performance and reliability, crews' attitude, inquiries/complaints, appreciation of travel speed and time, connectivity, accessability, information and environmental impact studied the passenger satisfaction in using public bus transport in Colombo, Sri Lanka. It is recommended to increase the frequency of buses during peak hours, adopt proper and standard transport policies, promote and use existing touch travel card system, display time tables in bus halts, povide more comfortable buses, improve connectivity between difference modes of transport, use new technology in public transport, and deploy skilled and trained crew in public buses. Ranawana and Hewage (2015) used more samples (400) compared to Chandrakumara (2014), Kanishka et.al.,(2015), Danthanarayana (2019) and Wijerathna (2016).

Chandrakumara and Pathmini (2015) using 100 passengers on convenience non-probabilistic sampling and univariate, bi-variat and multivariate analyses studied the passenger satisfaction in using Sri Lanka Railway Transport Service. Five diamentions of SERVQUAL model were used to measure the passenger satisfaction. Chandrakumara and Pathmini (2015) found that, (i) when service quality diamentions were used, all service quality diamentions were singnificantly correlated with passenger satisfaction; (ii) passengers had moderate level of satisfaction on overall satisfaction on railway transport service; (iii) as a whole, assurance and reliability are more significant than empathy, responsiveness and tangibility. It was also recommeded to maintain railway stations tidily, maintain garbage bins, increase porter service, use modern equipments to issue tickets, provide correct information and update them timely. Though, interms of number of samples and sampling method, Chandrakumara and Pathmini (2015) is not better compared to Ranawana and Hewage (2015) and Chandrakumara (2014).

Yaparathna and Ratnajeewa (2018) conducted a survey in Fort Railway station in Sri Lanka by distributing 400 questionnaires to selected passengers to find the

satisfaction of passengers using railway transport. Research used PCA with Varimax rotation with Kaiser normalization. It was found with exploratory factor analysis, using 298 responses to questionnaire, that (i) technology and transfer time (online/mobile ticketing, Online train schedule, IT usage, Information systems in railway, Easy access to information, time to transfer from rail to other mode, Time to transfer from train to train), (ii) affordability and connectivity (compatibility of train schedule & bus schedule, combined ticket for bus & train, Ease of access to train from bus, Price of Train ticket, cost of travel between train & other modes), (iii) convenience (Banking/ATM service, restaurants/food, restroom facilities, Safety/security at railway station, seating capacity/comfort), (iv) accessibility (ease of access to train from private vehicles, infrastructure available for railway transit, superstructure available for railway transit) and (v) walking distance (ease of access from cycle, distance from bus station, distance from parking lot) were the five factors determine the satisfation of passengers with eigenvalue greater than or equal to one.

2.5 Summary of Chapter 2

Literature review revealed that different researches used different service quality categories and aspects. Furthermore, the statistical methods used were diverse. Most of the service attributes to satisfy passengers in developing and developed countries (both African and Asian coountries, including Sri Lanka) are similar. However, in terms of satisfying customers, availability of transport service, physical attributes of vehicles (buses, metros and trains) and stations in developing countries were inferior compared to that of developed countries. Last study was done using Panadura – Kandy semi-luxury bus service as a case study in 2019. However, studies related to normal bus route has not been carried out in the recent past in Sri Lanka.

CHAPTER 3

MATERIALS AND METHODS

In this Chapter, method of primary data collection and statistical methods used for data analyses are briefly discussed.

3.1 Methods of Data Collection

In this study primary data were collected through a structured questionnaire. Google® Forms were used to collect and record responses of survey participants. All passengers getting into Kottawa – Pettah bus from Kottawa bus stand on during November 2019 given the website address of the Google® Form and requested to answer the questions in the Form.

A leaflet with the website address and the objectives of the survey were distributed for this purpose. The questionnaire consisted of several sections to cover the service quality aspects of public bus transport between Kottawa and Pettah.

3.2 Questionnaire

Structured questionnaire is given in Appendix 1.The questionnaire was pre-tested using five passengers. The questionnaire includes socioeconomic information of respondents (Question Nos. 1 to 10), physical characteristics of buses (Question Nos. 11 to 18), characteristics of conductors (Question Nos. 19 to 33), characteristics of drivers (Question Nos. 34 to 45), actions of the Government on the public bus transport system (Question Nos. 46 to 57), and satisfaction of passengers on public bus transport system (Question Nos. 58 to 62).

3.3 Sample Size

Taro Yamane random sampling formula (Yamane, 1967) shown in (3.1) is used to calculate the sample size.

$$n = \frac{N}{1+N*(e)^2} \quad (3.1)$$

where,

n = sample size,

N = population size, and

e = the acceptable margin of error, at 95% confidence level = 0.05

The number of passengers board Kottawa – Pettah buses from Kottawa bus stand on a weekday is approximately 15,000 and so N=15,000. Accordingly, by applying the formula (3.1) and the sampling error of 5% the sample size arrived is 390. The sample unit is a passenger traveling in a bus, in the bus route from Kottawa to Pettah.

3.4 Data Collection

The questionnaire was distributed to randomly-selected 500 passengers considering the response rate. It was stated in the questionnaire that not to fill the questionnaire again, if the respondent had already filled one. When the responses reached 400, accepting of responses were stopped.

3.5 Conceptual Models

Satisfaction of passengers using public bus transport is analysed using factor analysis. Figure 3.1 provides the graphical presentation of the construction of factors determining the satisfaction of passengers using public bus transport service. Answers to the questions on the individual characteristics related to buses, conductors and drivers, common characteristics of public bus transport, and actions of the Government of public bus transport are reported as Q_n's in Figure 3.1.

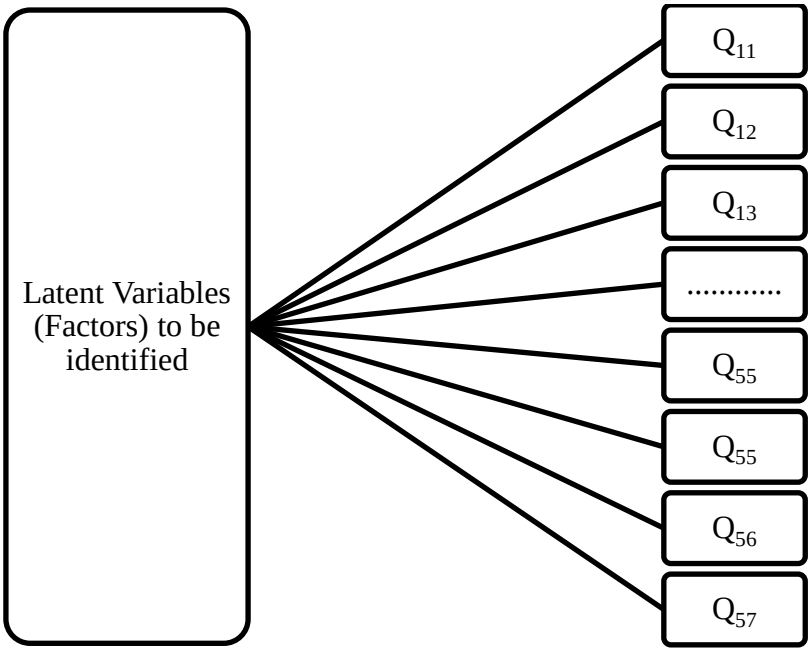

Figure 3.1 Conceptual Model on Deriving Factors Determining the Satisfaction of Passengers

Variables or questions and characteristics of four different aspects are shown in Table 3.1

Table 3.1: Variables/questions and the corresponding characteristics of public bus transport

Categorizing	**Variables related to Factors (as in the questionnaire)**
Physical Characteristics of Buses	Heights of Foot Boards Width of Bus Doors On Board Ceiling Height Width of Seats Length of Leg & Foot Space Height of Seat Head Rest Cleanness of Buses Bus breaking down with passengers on board

Table 3.1: Variables/questions and the corresponding characteristics of public bus transport (Continued…)

Categorizing	**Variables related to Factors (as in the questionnaire)**
Characteristics of Conductors	Issuing tickets to passengers Issuing tickets to passengers before the bus leaves the bus stand/halt Issuing tickets depicting the location of embarking and disembarking, the ticket fare date, and the number of the bus to passengers Issuing tickets for the correct bus fare Receiving the correct balance money Receiving courteous, polite and friendly service of conductors Transacting with intoxicated (drunken) conductors Transacting with betel chewing conductors Transacting with smartly and decently dressed bus conductors Harassment/bullying by conductors Conductors moving forward and backward inside the bus Giving adequate time to embark and disembark by conductors Conductors asking Passengers to embark and disembark through both doors Allowing passengers to be seated till bus comes to standstill for disembarking Experiencing conductors wearing uniform
Characteristics of Drivers	Experiencing speeding, reckless and dangerous bus driving Experiencing drivers breaking road rules while driving Experiencing drivers using mobile phones while driving Experiencing stopping buses at the appropriate place of the bus halt for passengers to embark and disembark Keeping the bus stopped till all passengers disembark and embark Experiencing drivers asking passengers to embark and disembark through both doors Receiving friendly, courteous, polite and welcoming service from drivers Travelling by bus driven by a well-mannered, smartly and decently dressed drivers Experiencing intoxicated drivers while driving seeing driver chewing betel while driving Playing audio/video with high volume Drivers wearing uniform

Table 3.1: Variables/questions and the corresponding characteristics of public bus transport (Continued…)

Categorizing	**Variables related to Factors (as in the questionnaire)**
Government's Actions	1. Availability of Bus Halts and Stands for passengers to wait 2. Cleanness of Bus halts/stands 3. Distance between two nearby bus stops 4. Availability of buses when needed 5. Keeping doors closed on moving buses with passengers on board 6. Number of passengers in buses 7. Level of crimes on the bus stands and inside buses 8. Imposing Laws relevant to public transport against offenders by the Police 9. Availability of passenger complaint handling process 10. Bus fare relative to the quality of bus service 11. Frequency of experiencing harassment by co-passengers 12. Convenience of the bus halts/stands

3.6 Reliability of the Questionnaire

Reliability is a measure shall consistently reflect the construct that it is measuring. Reliability of questionnaire is a way of assessing the quality of the measurement procedure used to collect data. In order to consider a result valid, the measurement procedure must first be reliable. The statistic, Chronbach's alpha determines the internal consistency in a survey instrument to gauge reliability of the questionnaire. It is computed using (3.2).

$$\alpha = \frac{N^2\overline{Cov}}{\sum S^2_{item} + \sum Cov_{item}} \qquad (3.2)$$

where:

N : the number of items,

$\overline{\text{Cov}}$: the average covariance between items (the average of the off diagonal elements in the variance–covariance matrix),

S^2_{item} : the sum of all the item variances, and

Cov_{item} : the sum of all covariance in the variance–covariance matrix.

It is suggested that the minimum number of α to satisfy for FA is 0.7.

3.7 Concept of Factor Analysis

Factor analysis is used to determine whether a set of observed covariance and/or correlation structure among the observed variables ('manifest' variables) can be explained in terms of smaller number of unobservable factors, known as 'latent' (or 'common') factors (Peiris, 2018). Thus the factor analysis seeks what are the hidden factors for the observed set of variables to be correlated. Thus, a typical factor analysis finds the solutions for following four questions:

i) how many different common factors are required to explain the pattern of relationship among the observed set of correlated variables?
ii) what is the nature of such common factors?
iii) how well do the latent factors explain the observed data set?
iv) how are the common factors useful for the user for decision making?

Factor analysis is defined as an exploratory instrument to reduce the dimensionality of multivariate data.

3.7.1 Data Conformity to Factor Analysis

Several steps are to be followed in performing factor analysis. Firstly, appropriateness of data for factor analysis shall be checked. Under this, four tests are performed;

Bartleet's test for sphericity checks whether correlation matrix is an identity matrix, this is tested

Ho: $\Sigma = \text{I}$ Vs. $H1: \Sigma \neq \text{I}$.

The null hypothesis should be rejected to follow factor analysis.

Sampling adequacy, comparing correlation coefficients and partial correlation coefficients, is tested using Kaiser-Meyer-Olkin (KMO) statistic. KMO statistic shall be higher than 0.6, in order for data to qualify for factor analysis.

When data is measured using multiple Likert scale, it is essential to test the internal consistency of data. Chronbach's Alpha is used to test the internal consistency of data. Chronbach's Alpha 0.7 and above is accepted as data has internal consistency.

Only for continuous data variables should be normal if factors are extracted using MLE. Normality is tested by Jarque-Bera statistic. However, as most of the variables are categorical, normality assumption may not be required.

3.7.2 Extraction of Factors

Of the various factor extraction methods in SPSS, the most common three factor extraction methods are principal component factoring, principal axis factoring and maximum likelihood factoring. Principal component factoring assumes that communalities of all variables equal to unity, resulting no prior estimates for communalities. In contrast, principal axis factoring assumed that the communalities equal to the summation of the squared multiple correlation of each variable with all other response variables. However, the advantage of both principal component factoring and principal axis factoring are that these methods can be used when normality assumption is violated. Therefore, these methods can be employed, when categorical variables are used.

In contrast, maximum likelihood factoring assumes that all variables are normal. The advantages of maximum likelihood factoring are that it provides limited range goodness-of-fit indices and allows for statistical tests and the results are invariant for both correlation and covariance matrices. Nevertheless, maximum likelihood factoring cannot be used in this research, as most of the variables are categorical variables, and does not fulfil normality assumption.

3.7.3 Kaiser–Meyer–Olkin Measure of Sampling Adequacy

KMO is the ratio of the squared correlation between variables to the squared partial correlation between variables (Field, 2009). KMO statistic ranges between zero and one. A KMO value of zero shows that the summation of partial correlations is large related to the summation of correlations, indicating distribution in pattern of correlations, resulting that the data may not be appropriate for factor analysis. A KMO value closer to 1 specifies that when patterns of correlations are compact relatively, the KMO statistic will be close to one; hence, factor analysis is suitable and shall provide distinctive reliable factors. Further, Kaiser (1974) suggests that a KMO statistic of greater than 0.5 as barely acceptable. However, Hutcheson& Sofroniou (1999) illustrates that KMO statistic between 0.5 and 0.7 as mediocre, 0.7and 0.8 as good, 0.8 and 0.9 as great, and greater than 0.9 as superb.

3.7.4 Rotation of Factors

Once the factors are extracted, it is compulsory to rotate the factors. Rotation of factors was introduced to make factors simple and meaningful, and differentiate each factor based on factor coefficients.

Two types of rotation of factors are orthogonal rotation and oblique rotation. Orthogonal rotation rotates factors, maintaining factors independent. All factors were independent prior to rotation, and thus orthogonal rotation also makes sure that factors remain the same. The popular orthogonal rotations are: Varimax, Quartimax and Equimax. The popular oblique rotation methods are direct oblimin and promax rotation, but these rotations are not commonly used as the rotated factors are not independent. That is, when applying oblique rotation, factors are permitted to correlate.

For a given factor extraction method, factors are rotated using all three rotation methods, in order to check whether the results are invariant to different types of rotation. If the results are not invariant, the results under Varimax will be used.

3.7.5 Determination of Number of Factors

Factor analysis generates factors as high as the number of variables in the system. However, not all factors are retained in factor analysis. As one of the objectives of factor analysis is to reduce the dimensionality of variables; less numbers of factors are selected as appropriate. Several objective measures are used to determine the number of factors to retain. Two popular methods are size of Eigenvalues and the L-bow shape of the scree plot. The factors with Eigenvalue greater than one are retained as factors to be selected. This criterion is popularly known as Kaiser-Meyer Rule.

The plot a graph of each eigenvalue in descending order (y-axis) against respective factor number (x-axis) is known as 'scree plot'. The scree plot takes a sharp decline in the curve followed by a tailing off. The number of components at which scree plot shows the elbow shape is considered as the number of factors to be selected (Cattell, 1966).

As a third method, Bentler's (1968) formula is used to find the internal consistency (reliability) of each factor extracted. This formula is given below (3.3).

$$\theta_i = \left[\frac{p}{(p-1)}\right] * \left[1 - \left(\frac{1}{\lambda_i}\right)\right] \quad (3.3)$$

where

θi: Bentler's Alpha for ith Factor

p: Number of variables in the system and

λ_i: Eigen value of each factor

It has been recommended that θ_i should be than zero to consider the factor i by Bentler.

The selected number of principal components may not be same as the number of common factors for factor analysis. As a result, some objective and subjective criteria are used to find the number of common factors in factor analysis. In order to use objective criteria, data shall be normal. As this research primarily uses categorical data, objective criterion may not be useful to identify number of common factors. Hence, subjective criteria are to be used. One subjective criterion states that the communalities of all variables shall be closed to unity. Other subjective criterion states that the difference between the correlations of observed variables and correlations reproduced by the factor analysis shall be zero.

3.7.6 Communality

Total variance of each variable has two components; unique variance and common variance. Unique variance is the measure of variability reliably attributed one particular variable. The variability a variable shares with other variables in the system is called common variance. Nevertheless, the variance not reliably attributed to one measure is known as random variance.

Communality is the proportion of common variance present in a variable. When a variable has no random variance; communality is one, whereas, if a variable shares all of its variance with other variables in the system has a communality of zero. Since factor analysis finds the common underlying dimensions, factor analysis gives special attention to common variance. Therefore, it is required know the degree of common variance present in research data.

Accordingly, in factor analysis, the proportion of variance explained by the factors extracted in known as communality. Retained factors do not explain all the variance in data, as a result, after extraction communalities are always less than one. Communalities closer to one mean, retained factor better explain the original data. If more factors are retained, communalities will be higher, thus, communalities are good indices to decide whether too high or less number of factors is retained.

3.7.7 Factor Score Coefficient

Once each observed variable is represented by linear functions of common factors and unique factors, it is necessary to define factors also from original (selected) variables**.** In other words, unlike principal components scores, which are computed, the factor scores have to be estimated in FA. Multiple linear regression is one of the methods used to estimate factor score coefficients in SPSS. Let$\hat{\mathrm{F}}_{\mathrm{i}}$ be the estimated factor score for the ith factor then,

$\hat{\mathrm{F}}_{\mathrm{i}} = \hat{\beta}_1 X_{i1} + \hat{\beta}_2 X_{i2} + \hat{\beta}_3 X_{i3} + \cdots \ldots . + \hat{\beta}_p X_{ip}$(i=1,2, ...m).

Thus $\widehat{\beta_i'}s$ are the coefficients of linear combinations to predict values of the selected factors and these coefficients are known as factor score coefficients. The factor score coefficients are functions of the original standardized variables. Thus factor score can depend on the type of rotation as well as type of extraction. In other words, the factor scores are not unique. As a result, some researchers hesitate to use the factor scores for interpretation.

CHAPTER 4

EXPLORATORY DATA ANALYSIS

Chapter 4 explains exploratory data analysis of data collected through structured self-administered questionnaire from 400 participants: passengers of public bus transport service in Kottawa – Pettah Route. Basic statistical analyses of the respondents' demographic and socioeconomic characteristics, satisfaction on conductors, buses, drivers, and actions of the Government are carried out.

4.1 Distribution of Demographic and Socioeconomic Variables

4.1.1 Age

According to Figure 4.1, it is clear that the majority of respondents (52%) is in the age group of (28-36) followed by 28% in the age group of (18-27) years.

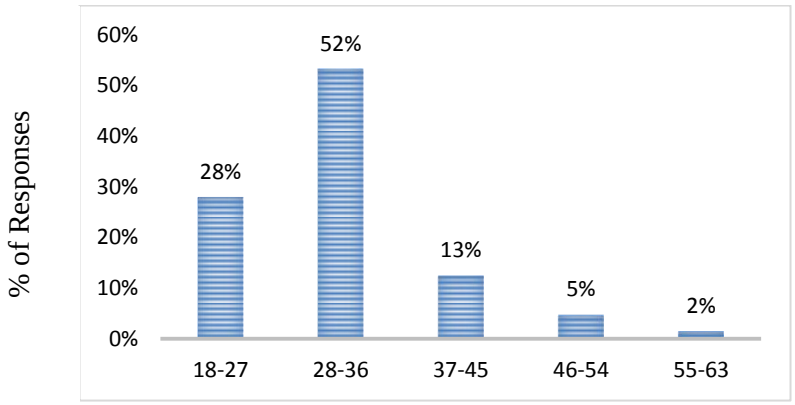

Figure 4.1: Distribution of age of respondents

Descriptive statistics of age of respondents are presented in Table 4.1. Age of respondents varies from 18 years (minimum) to 63 years (maximum) with a mean of 31 and the SE of the mean of 7.5. As the median, mode and mean are almost equal, it can be hypothesized that distribution of age is normal. In fact using JB test (247.6), it can be concluded with 95% confidence that the distribution of age is not significantly deviated from normal distribution, as the respective p-value is less than 5%.

Table 4.1: Descriptive statistics of age

Statistics	Years
Mean	31
Median	29
Mode	29
Minimum	18
Maximum	63
SE of the mean	7.5
JB Statistics	247.6 (p= 0.000)

4.1.2 Gender

Figure 4.2 represents the distribution of respondents in terms of gender. Majority of respondents are male (56 %), while the female respondents account for 44%.

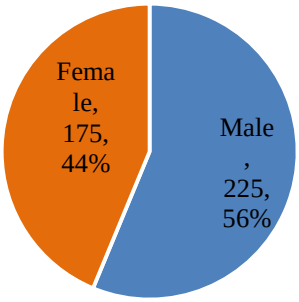

Figure 4.2: Distribution of gender of respondents

4.1.3 Height

As shown in Figure 4.3, almost half of the respondents belongs to the height group of (58-63) inches, while almost one third of respondents represents (64-69) inches group.

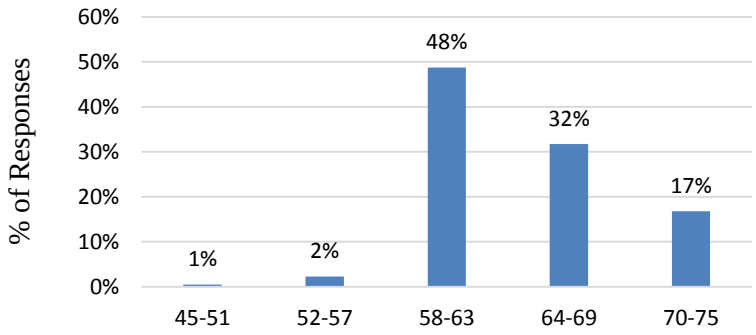

Figure 4.3: Height distribution of respondents

Descriptive statistics of height of respondents are presented in Table 4.2. The height varies from 45 Inches (minimum) to 75 Inches (maximum) with a mean of 64 Inches and the SE of the mean of 4.7. As the median, mode and mean are almost equal, it can be hypothesized that distribution of age is normal. However, according to JB test

(2.04), it can be concluded with 95% that the distribution of age is significantly deviated from normal distribution, since the relevant p-value is higher than 0.05. Non-normality of height of respondents may be due to very few respondents with height less than 55 Inches.

Table 4.2: Descriptive statistics of height

Statistics	Inches
Mean	64
Median	63
Mode	60
Minimum	45
Maximum	75
SE of the mean	4.7
JB Statistic	2.04

4.1.4 Weight

Distribution of weights of respondents is reported in Figure 4.4. Majority of respondents, 44%, represents the weight group of (51-65) Kilograms; 29% represents (66-80) Kilograms; while 16% represents (36-50) weight group.

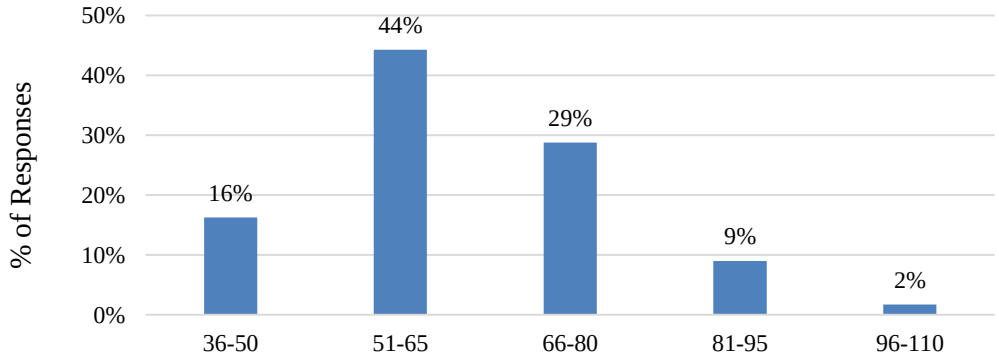

Figure 4.4: Weight distribution of respondents

Descriptive statistics of weights of respondents is given in Table 4.3. Weights of respondents range from 35 to 110 Kilograms. Average weight of respondents was 64 Kilograms with a SE of mean of 13.4 Kilograms. Median and mode of respondents were 62 and 60 years, respectively. As mean, median and mode are close to each other, weights of respondent may be normally distributed. It is further established by significant JB statistic of 21.6, resulting that distribution of weights is not significantly deviated from normal distribution.

Table 4.3: Descriptive statistics of weights of respondents

Statistics	Kilograms
Mean	64
Median	62
Mode	60
Minimum	35
Maximum	110
SE of mean	13.4
JB Statistic	21.6 (p=0.000)

4.1.5 Marital Status

Marital status of respondents is reported in Figure 4.5. Fifty-five per cent of respondents was single, while 44% of respondents was married and a marginal one per cent of respondents was split/divorced/widowed.

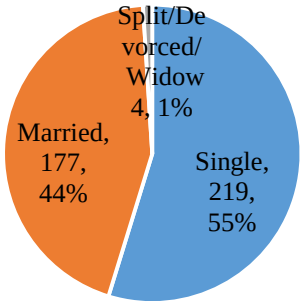

Figure 4.5: Marital status of respondents

4.1.6 Vehicle Ownership of Respondents

Vehicle ownership of respondents is shown in Figure 4.6. Majority of respondents, 61%, did not own a vehicle, 39% of respondents owned a vehicle.

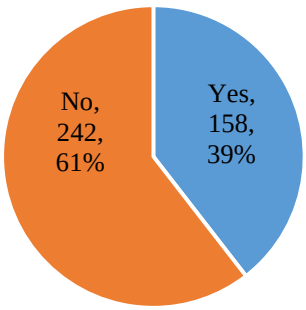

Figure 4.6: Vehicle ownership of respondents

4.1.7 Sector-wise Employment Details

Sector-wise employment details of respondents are given in Figure 4.7. Private sector employees accounted for 45% of respondents, followed by the Government sector

with quarter of the responses. Semi-government and not-employed responses accounted for 14% and 15%, respectively.

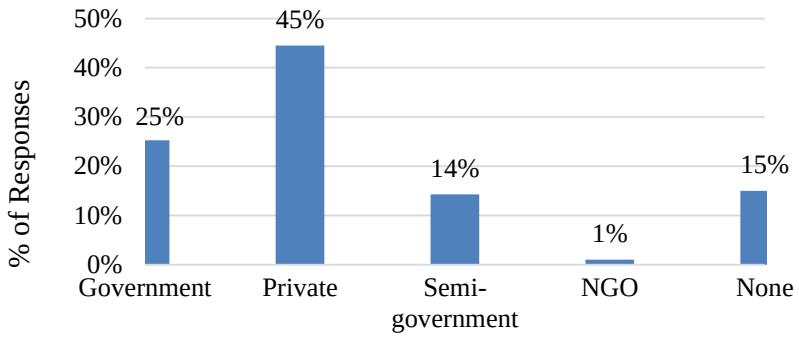

Figure 4.7: Sector-wise employment of respondents

4.1.8 Annual Income Levels

Income levels of respondents are given in Figure 4.8. Income levels of respondents below Rs. 300,000 p.a., and between Rs. 300,000 p.a. and Rs. 600,000 p.a. income groups are almost equal amounting to 34% and 33%, respectively. Income levels of respondents between Rs. 600,000 p.a. and Rs. 900,000 p.a. and between Rs. 900,000 p.a. and Rs. 1,200,000 p.a. are 15% and 7%, respectively. 11% of respondents earned more than Rs. 1,200,000 p.a. Thus, it may be concluded that majority of passenger using public bus transport are relatively low income earners.

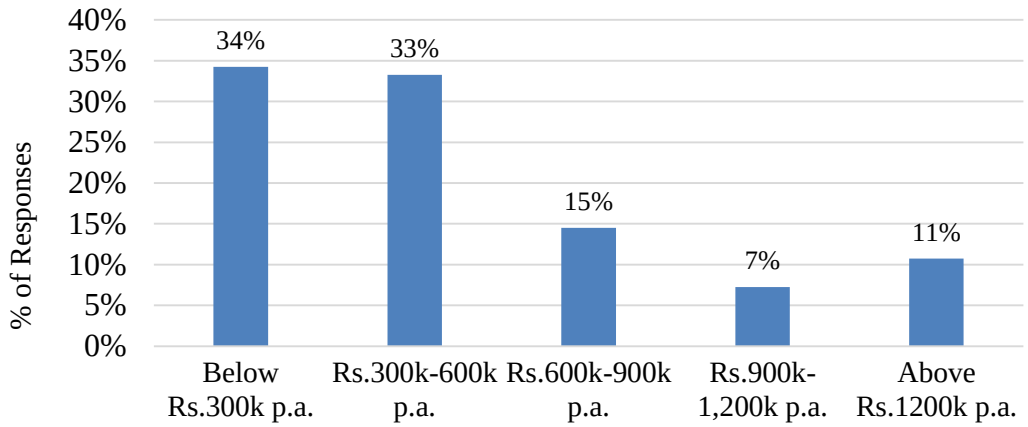

Figure 4.8: Income levels of respondents

4.1.9 Travel Time

Travel time of respondents is reported in Figure 4.9. Around 25% of respondents each travel 26-50 minutes, 51-75 Minutes, and 76-100 minutes. 11% of respondents travel less than 25 minutes on one-way trip. 14% of respondents travel close to two hours on a one-way trip.

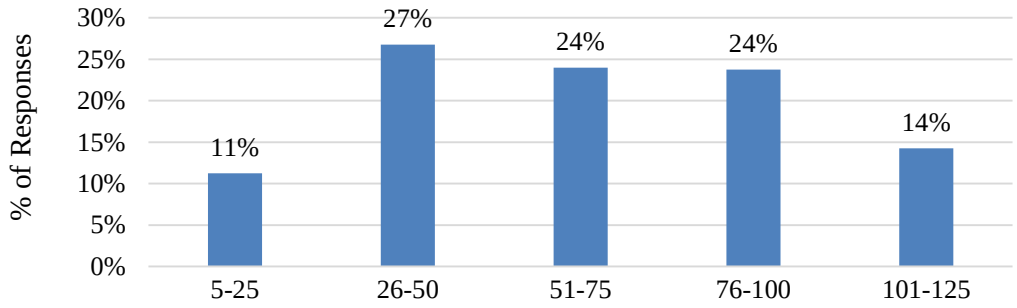

Figure 4.9: Travel Time of Respondents

Descriptive statistics of travel time is reported in Table 4.4. Travel time ranges from five minutes to two hours (120 minutes). Average travel time is 66 minutes with a SE of mean of 33 minutes. Median and mode of travel time are 60 minutes each. Since, mean median and mode are almost equal, it can be assumed that the travel time of respondents may follow normal distribution. It was confirmed by significant JB statistic of 20.4 (p=0.000) and thus it can be concluded with 95% confidence level that the travel time does not significantly deviate from normal distribution.

Table 4.4: Descriptive Statistics of travel time

Statistics	Minutes
Mean	66
Median	60
Mode	60
Minimum	5
Maximum	120
SE of mean	33
JB Statistic	20.4 (0.000)

4.1.10 Travel Distance of Respondents

Travel distances of respondents are reported in Figure 4.10. Little less than 25% of respondents, 23% and 24%, travel 6-10 Kilometers and 11-15 Kilometers per one way trip per day, respectively. 19% and 21% of respondents travel 11-15 Kilometers and 20-23 Kilometers per one way trip per day, respectively. 14% of respondents travel less than five Kilometers per one way trip per day.

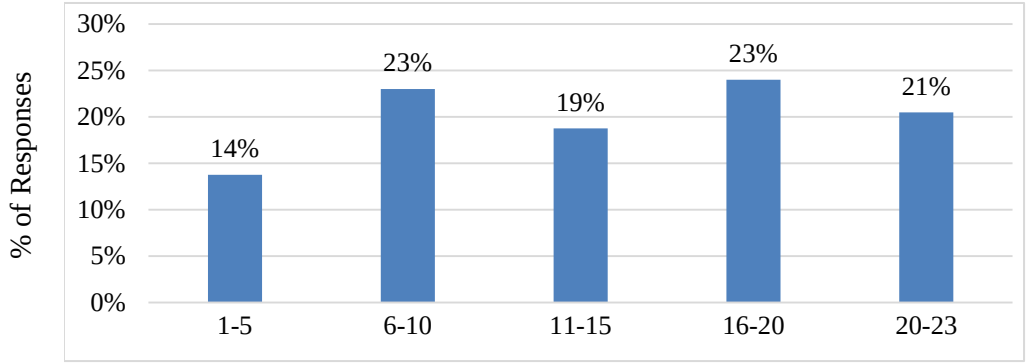

Figure 4.10: Travel Distance of Respondents

Descriptive statistics of travel time is reported in Table 4.5. Travel distances of respondents ranges from one to 22 Kilometers on a one way trip. Average distance travelled per trip per day is 14 Kilometers with a SE of mean of 6.6 Kilometers. Median and mode of travel distance are 15 and 22 Kilometers, respectively. As established by JB statistic of 31.9 with p value is less than 0.05, it can be concluded with 95% confidence that travel distance of passengers does not significantly deviate from normal distribution.

Table 4.5: Descriptive statistics of travel distance

Statistics	Kilometers
Mean	14
Median	15
Mode	22
Minimum	1
Maximum	22
SE of mean	6.6
JB Statistic	31.9 (p=0.000)

4.2 Passengers' Views of Characteristics of Buses

4.2.1 Height of Foot Boards

Table 4.6 represents the passengers' responses on the height of foot board. A clear majority 70% of participants responded that the height of foot boards is with right height. However, 26% of respondents noted that foot board is tall.

Table 4.6: Views on the height of foot board

Category	% of Respondents
Right height	70
Tall	26
Short	4

4.2.2 Width of Bus Doors

Responses with respect to the width of bus door are produced in Table 4.7. 71% of, respondents responded that width of door is of right size. However, 28% respondents answered that width of door is small.

Table 4.7: Views on the width of bus door

Category	% of Respondents
Right	71
Small	28
Large	1

4.2.3 Height of Buses

Table 4.8 represents the passenger opinion on the height of bus. High majority of respondents, 81%, replied that bus is of right height. However, around 10% of respondents noted that it is tall, and a similar amount of respondents, nine per cent, reacted that it is short.

Table 4.8: Views on the height of buses

Category	% of Respondents
Right height	81
Tall	10
Short	9

4.2.4 Views on Width of Seats

Respondents' perception on width of seats is shown in Table 4.9. Little less than two third of respondents, 64%, perceived that the size of seat is small. On the other hand, little more than one third, 35% of respondents felt that seat is of right size.

Table 4.9: Views on the width of seats

Category	% of Respondents
Right	64
Small	35
Large	1

4.2.5 Leg Space of Seats

Figure 4.11 represents the passengers' views on the length of leg space. Similar to the views on the width of seats, majority 64% thought leg space as short, on the other hand, 35% respondents thought that leg space as right length.

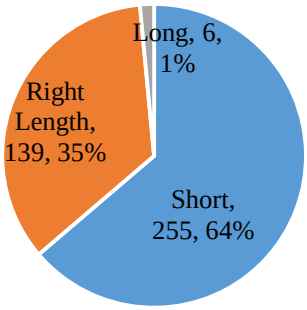

Figure 4.11: Length of leg space

4.2.6 Height of Seat Head Rest

Respondents' view on the height of head rest is displayed in Figure 4.12. 46% of respondents' judgment was that height of head rest was short; anyhow, 11% of respondents viewed head rest as tall. However, 43% of respondents felt that head rest is of right height.

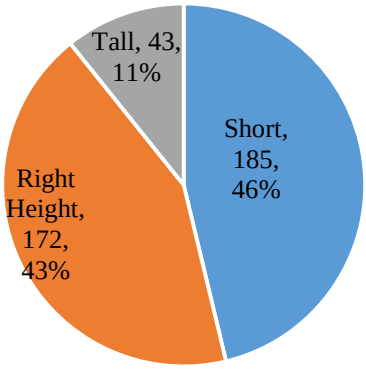

Figure 4.12: Distribution of height of head rest

4.2.7 Cleanness of Buses

Table 4.10 represents the passengers' opinion on the cleanness of bus. 70% of respondents perceived that bus as not clean; in contrast, 30% of respondents felt that bus was clean.

Table 4.10: Views on the cleanness of bus

Category	% of Respondents
Clean	30
Not Clean	70

4.2.8 Bus Breakdown with Passengers On Board

Perception of Passenger on breaking down of bus, while passengers on board, is shown in Table 4.11. 85% of respondents perceived that bus breaks down with passengers on board. Conversely, 11% of respondents opted to answer that bus never breakdown with passengers on board.

Table 4.11: Views on bus breakdown with passengers on board

Responses	% of Respondents
Frequently	11
Sometimes	85
Never	4

4.3 Responses on Characteristics of Conductors

Table 4.12 presents the characteristics of conductors, using 15 different measures, as felt by the respondents. Results in Table 4.12 indicate that 20% perceived that conductor issues tickets most of the time, while 29% and 51% perceived that conductors issue tickets few times and sometimes, respectively.

The percentage of people who claimed that conductors issued tickets before bus starts to move from the bus stand/halt is 60. The balance 33% observed that sometimes conductors issue tickets before bus starts to move from the bus stand/halt. 44% felt that most of the times conductor issue tickets for the correct bus fare, while 36% felt that sometimes conductor issue tickets for the correct bus fare, however, 21% felt that few times conductor issue tickets for the correct bus fare.

Forty-three per cent of respondents sensed that few times conductors repay the correct balance money; similarly, 45% sensed that sometimes conductors repay the correct balance money. marginally more than two-third or 36% recognized that few times, 47% recognized sometimes and 17% recognized most of the times conductors issue tickets depicting the location of embarking and disembarking, the ticket fare, date, and the bus number.

Table 4.12: Characteristics of conductors

Characteristics of Conductors	Few times	Some times	Most of the times	Total
Issuing Tickets	117	205	78	400
	29%	51%	20%	100%
Issuing Tickets before Bus Starts to Move	242	130	28	400
	60%	33%	7%	100%
Issuing Tickets for the Correct Bus Fare	83	143	174	400
	21%	36%	43%	100%
Repaying the Correct Balance Money	171	179	50	400
	43%	45%	12%	100%
Issuing tickets depicting the location of embarking and disembarking, the ticket fare, date, and the bus no.	145	188	67	400
	36%	47%	17%	100%
Receiving courteous, polite and friendly service from conductor	131	213	56	400
	33%	53%	14%	100%
Transacting with intoxicated (drunken) conductor	225	153	22	400
	56%	38%	6%	100%
Transacting with betel chewing conductor	121	216	63	400
	30%	54%	16%	100%
Transacting with smartly and decently dressed bus conductor	171	198	31	400
	43%	50%	7%	100%
Harassment/bullying by conductor	150	200	50	400
	37%	50%	13%	100%
Conductors moving forward and backward inside the bus	16	83	301	400
	4%	21%	75%	100%
Giving adequate time to embark and disembark by conductor	84	257	59	400
	21%	64%	15%	100%
Conductors asking Passengers to embark and disembark through both doors	44	191	165	400
	11%	48%	41%	100%
Allow passengers to be seated till bus comes to standstill for disembarking	150	194	56	400
	38%	49%	13%	100%
Conductors wearing uniform	153	188	59	400
	38%	47%	15%	100%

Majority of respondents (53%) acknowledged that sometimes courteous, polite and friendly service was received from conductors. However, only 14% respondents acknowledged that most of the times courteous, polite and friendly service was received from conductors. It was found that 56% of respondents witnessed intoxicated conductors few times, while 38% witnessed it sometimes, only 17% most of the times.

Fifty-four per cent of respondents transacted with betel chewing conductors sometimes, 30% of respondents transacted with betel chewing conductors few times, and only 16% transacted with betel chewing conductors most of the times.

Half of the respondents sometimes noted smartly and decently dressed bus conductors, whereas, 43% respondents few times noted smartly and decently dressed bus conductor. Half of the respondents sometimes faced harassment/bullying by conductors, 38% few times faced harassment/bullying by conductors and 13% of respondents most of the times faced harassment/bullying by conductors. A clear majority of respondents, 75%, most of the times, experienced conductors moving forward and backward inside the bus; 21% experienced it sometimes.

A strong majority of 64% sometimes observed conductors giving adequate time to embark and disembark. The corresponding percentages are 21% and 15% few times and most of the times observed conductors giving adequate time to embark and disembark, respectively.

Little less than half of the respondents, 48%, were sometimes asked to embark and disembark through both doors; 41% of respondents were most of the times asked to do so. Little less than half, 49%, and 38% of respondents sometimes and few times were allowed to be seated till bus comes to standstill for disembarking, and only 14 were allowed to be seated till bus comes to standstill for disembarking. 47% of respondents sometimes seen conductors wearing a uniform, 38% few times seen it, and only 15% seen conductors wearing uniform most of the times.

4.4 Views on Characteristics of Drivers

Views of respondents on characteristics of public bus drivers are reported in Table 4.13. This section explains the characteristics of drivers relevant to nature of driving, dressing, association with passengers and following rules of public bus transport according to the responses of passengers. Results in Table 4.13 indicate that 50% of people claimed that most of time drivers are speeding, reckless and dangerous bus driving. The corresponding figure for some times and few times are 42% and 8% respectively.

Table 4.13: Characteristics of drivers

Characteristics	Few times	Some times	Most of the times	Total
Speeding, reckless and dangerous bus driving	34	168	198	400
	8%	42%	50%	100%
Drivers breaking road rules while driving	36	157	207	400
	9%	39%	52%	100%
Drivers using mobile phones while driving	68	207	125	400
	17%	52%	31%	100%
Not stopping buses at the appropriate place of the bus halt for passengers to embark and disembark	66	234	100	400
	16%	59%	25%	100%
Not keeping the bus stopped till all passengers disembark and embark	69	209	122	400
	17%	52%	31%	100%
Drivers asking Passengers to embark and disembark through both doors	161	204	35	400
	40%	51%	9%	100%
Receiving friendly, courteous, polite and welcoming service from drivers	188	187	25	400
	47%	47%	6%	100%
Travelling by bus driven by a well-mannered, smartly and decently dressed drivers	151	215	34	400
	38%	54%	8%	100%
Experiencing intoxicated drivers while driving	80	226	94	400
	20%	56%	24%	100%
Seeing driver chewing betel while driving	80	226	94	189
	20%	56%	24%	100%
Playing audio/video with high volume	28	161	211	400
	7%	40%	53%	100%
Drivers wearing uniform	162	190	48	400
	40%	48%	12%	100%

The ranking order of the percentages of respondents claimed that drivers are breaking road rules while driving are 52% (most of times) > 39% (sometimes) > 9% (few times). It was found that 83% of respondents experienced drivers using mobile phones while driving at least sometimes (that is 31% for sometimes and 52% for most of the times).

Furthermore, results in Table 4.13 indicate that 59% respondents sometimes felt that drivers didn't stop buses at the appropriate place of the bus halt for passengers to embark and disembark, and 25% respondents most of the times felt that drivers didn't stop buses at the appropriate place of the bus halt for passengers to embark and disembark 31% and 52% of respondents most of the times and sometimes, respectively, experienced drivers not keeping the bus stopped till all passengers

disembark and embark. Results indicate that 47% of respondents sometimes received friendly, courteous, polite and welcoming service from drivers, another same per cent of respondents few times received friendly, courteous, polite and welcoming service from drivers.

About 38% of passengers few times travelled by bus driven by a well-mannered, smartly and decently dressed drivers, and more than half (54%) of respondents sometimes travelled by bus driven by a well-mannered, smartly and decently dressed drivers. 57% of passengers sometimes sensed intoxicated drivers while driving, and quarter of respondents most of the times felt that drivers intoxicated while driving. Clear majority (57%) of respondents sometimes experienced betel chewing drivers, while 24 % of respondents experienced betel chewing drivers most of the times and 20% of respondents few times seen drivers chewing drivers while driving.

Furthermore, all most all passengers (93%) at least sometimes (53% most of the times and 40% sometimes) experienced that drivers playing audio/video with high volume with passengers on board. Close to half of respondents noted that sometimes drivers wearing uniform, and 41% of respondents felt that few times drivers wearing uniform.

4.5 Responses on the Actions of the Government on Public Bus Transport

4.5.1 Availability of Bus Halts and Stands

Extent of availability of bus halts as per respondents' view is presented in Figure 4.13. 58% (Available in Every Place – 12% and Available in some places – 46%) of respondents felt that bus halts were available at least in some places. Further, 30% and 12% respondents felt that bus halts were available in few and very few places, respectively.

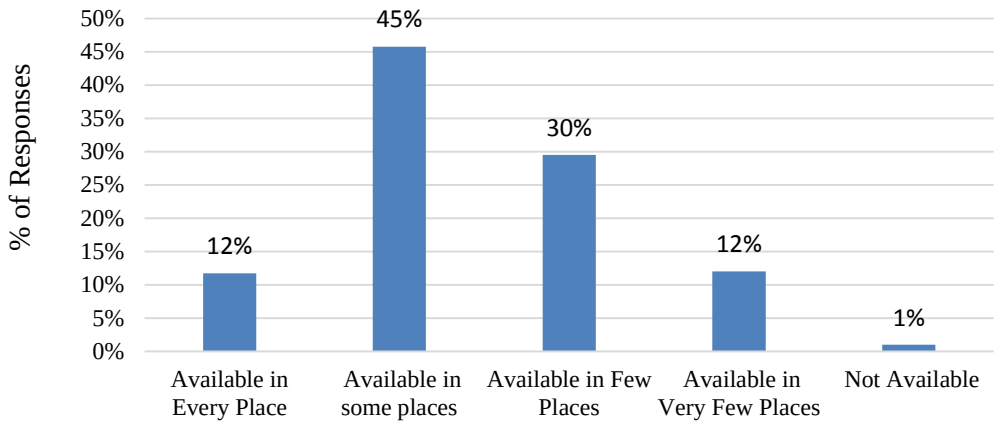

Figure 4.13: Availability of bus halts and stands

4.5.2 Views on Cleanness of Bus Halts

Respondents' view on cleanness of bus halts is shown in Figure 4.14. It is surprising to note that 84% claimed that bus halts were not clean as against 16% who felt that bus halts as clean.

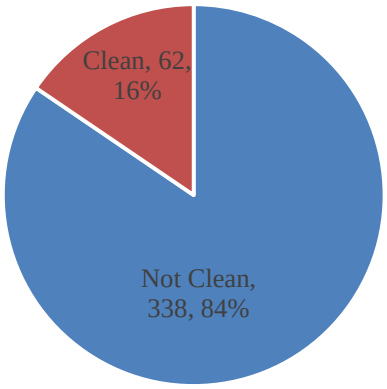

Figure 4.14: Cleanness of bus halts

4.5.3 Opinions on Distance between Two Bus Halts

According to results in Figure 4.15, it can be concluded that 53% of respondent felt that bus halts were kept in short distance while the balance 47% of the respondents felt that bus halts were in long distance. In fact, it is clear that there is not much difference between two thoughts.

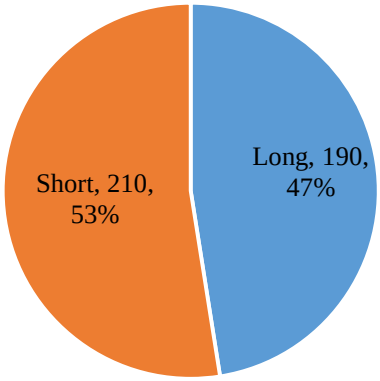

Figure 4.15: Distance between two bus halts

4.5.4 Responses on Availability of Buses

Respondents' judgment on availability of buses when in need is reported in Table 4.14. A clear majority of 62% of respondents responded as saying that buses were not available when they were in need. In contrast, 38% of respondents answered as saying that buses were available when they were in need.

Table 4.14: Availability of buses

Availability of Buses	% of Respondents
Yes	38
No	62

4.5.5 Views on keeping Doors Closed on Moving Buses

All most all respondents (98%) stated that doors of buses were kept not closed while buses were moving at the risk of passengers and other stakeholders. This is very serious issue. The policy makers should take some action.

4.5.6 Opinions on relative Cost of Travelling

Based on the results in Table 4.15, it can be said that 38% of respondents believed the bas fare as expensive, on the other hand, 34% believed that it was economical. However, 28% of respondents believed that the current bus fare as the right fare.

Table 4.15: Relative cost of travelling

Relative Bus Fare	% of Respondents
Expensive	38
Right fare	28
Economical	34

4.5.7 Responses on Police enforcement of Laws on Public Bus Transport

Respondents view on enforcement of Laws against wrongdoers is shown in Table 4.16. Unexpectedly, 15% of respondents never experienced police enforcing Laws against wrong doing bus drivers or conductors, a similar per cent of respondents responded as saying that frequently police enforced Laws against wrong doing bus drivers or conductors. Nonetheless, a clear majority of 71% of respondents noted that only sometimes police enforcing Laws against wrong doing bus drivers or conductors.

Table 4.16: Relative cost of travelling

Statistics	% of Respondents
Frequently	14
Sometimes	71
Never	15

4.5.8 Views on the Trust on Complaint Handling Process

Based on results in Figure 4.16, it can be concluded that 79% of respondents placed no confidence on the complaint handling process. In contrast, 21% of respondents placed trust on the current complaint handling process.

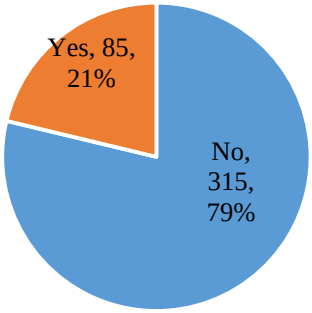

Figure 4.16: Complaint handling process

4.5.9 Opinions on Crowding in Buses

Respondents' experience on crowding on board is given in Figure 4.17. Most of the respondents, 89%, experienced over crowded buses, however, only 11% felt that buses were not over crowded.

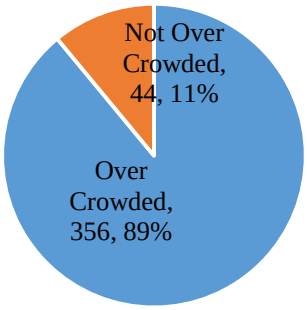

Figure 4.17: Crowd on board

4.5.10 Responses on Harassment by Co-passengers

Respondents view on harassment of passengers is reported in Table 4.17. According to 72% of respondents, passenger harassment in public transport is happening sometimes, while 21% responded as it never happened in public bus transport, however, seven per cent of respondents frequently experienced harassment by co-passengers frequently.

Table 4.17: Passengers' views on harassment by co-passengers

Responses	% of Respondents
Never	21
Sometimes	72
Frequently	7

4.5.11 Views on Crimes on Public Bus Transport System

Perceived levels of crimes on bus stands/buses are shown in Table 4.18. Little more than half, 51%, of respondents felt there was medium level of crimes in bus halts/buses, 40 percent perceived that it was low, and only nine per cent believed that it was high.

Table 4.18: Passengers' views on crimes on public bus transport

Level of Crimes	% of Respondents
Low	40
Medium	51
High	9

4.6 Satisfaction of Passengers on different Attributes of Public Bus Transport Service

4.6.1 Satisfaction of Passengers on the Characteristics of Buses

Satisfaction of passengers on the characteristics of buses is shown in Figure 4.18. Marginally less than half, 49%, of passengers were dissatisfied with the characteristics of buses. In addition, another 11% of respondents were very dissatisfied with the characteristics of buses. As against, almost a quarter of passengers were satisfied (23%) or very satisfied (2%) with the characteristics of buses. As a result, it can be derived that largely (60%) respondents were not satisfied with the characteristics of buses.

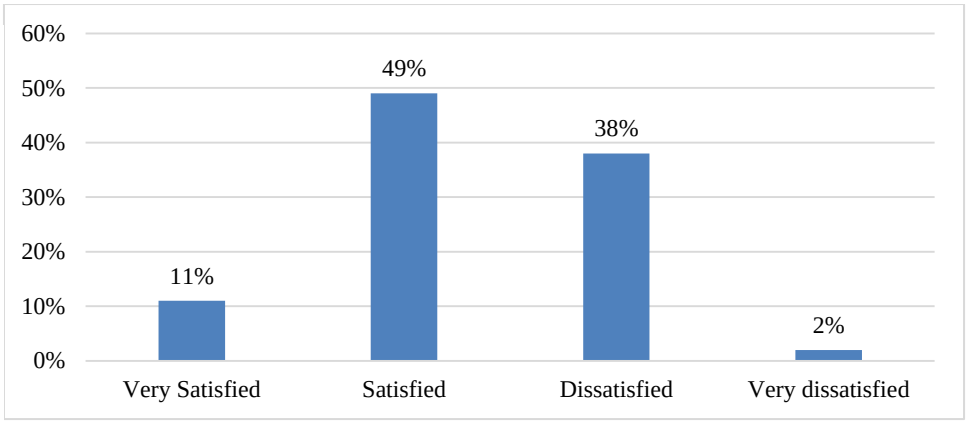

Figure 4.18: Passenger satisfaction on characteristics of buses

4.6.2 Satisfaction of Passengers on the Characteristics of Conductors

Satisfaction level of passengers on the characteristics of conductors is provided in Figure 4.19. 21% of respondents were satisfied with the characteristics of conductors. 12% and little over half, 51%, of respondents were very dissatisfied and dissatisfied with the characteristics of conductors. Thus, it can be proven that majority (63%) of respondents were not satisfied with the characteristics of conductors.

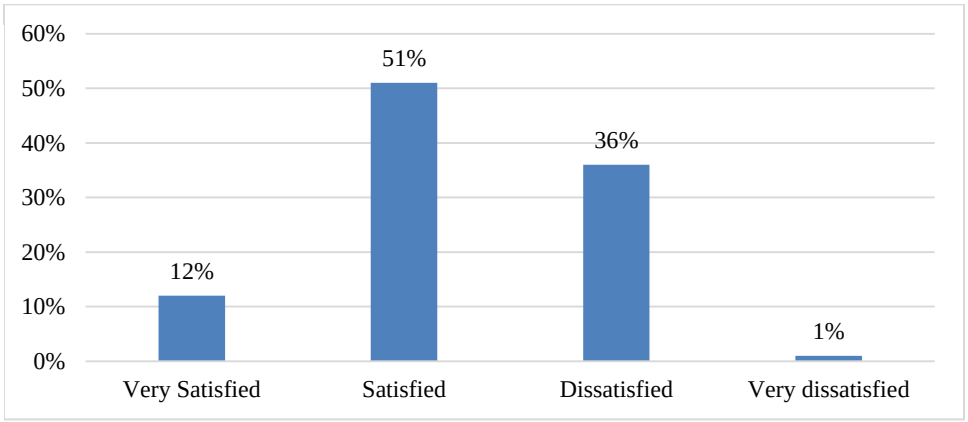

Figure 4.19: Passenger satisfaction on characteristics of conductors

4.6.3 Satisfaction of Passengers on the Characteristics of Drivers

Figure 4.20 shows the satisfaction of passengers on the characteristics of drivers of public buses. Little less than half, 49%, of respondents were dissatisfied with the characteristics of drivers, while, nine per cent of passengers were very dissatisfied with the characteristics of drivers. In contrast, 24% and one per cent of respondents were satisfied and with the characteristics of drivers. Therefore, it can be established that majority of respondents (58%) were not satisfied with the characteristics of drivers.

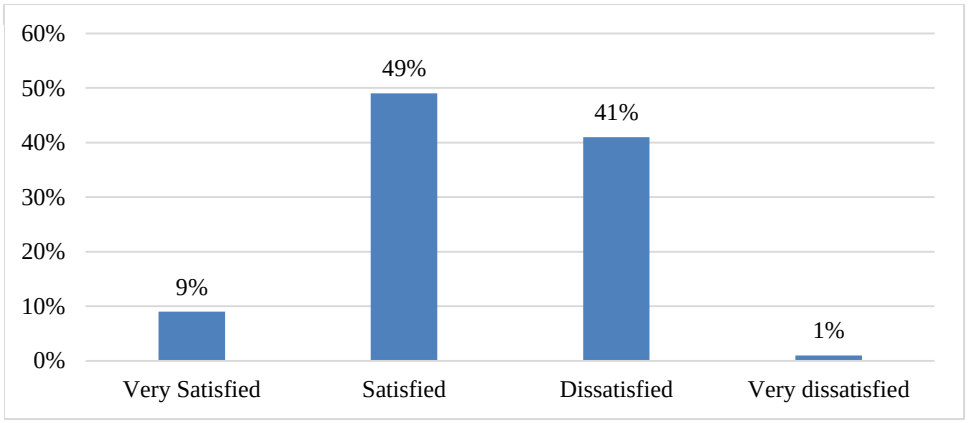

Figure 4.20: Passenger satisfaction on characteristics of drivers

4.6.4 Satisfaction of Passengers on Actions of the Government on the Public Transport System

Satisfaction of passengers on actions of the Government on the public bus transport system is presented in Figure 4.21. A clear majority of 77% respondents were very dissatisfied (16%) or dissatisfied (61%) with the actions of the Government on the public bus transport system. On the other hand, 11% of respondents were satisfied with the actions of the Government on the public bus transport system. Accordingly, it can be concluded that a clear majority of respondents were not satisfied with the actions of the Government on the public transport system.

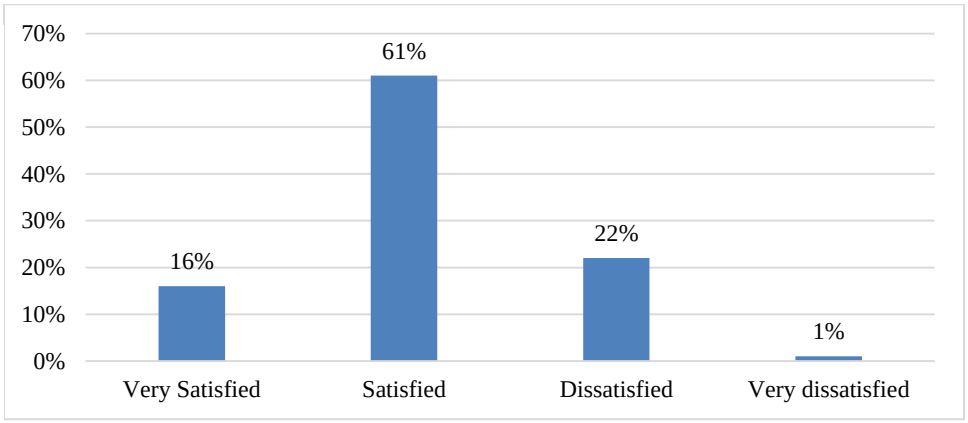

Figure 4.21: Passenger satisfaction on the actions of the Government on the public bus transport system

4.7 Overall Satisfaction of Passengers on the Public Bus Transport System

Figure 4.22 shows the overall satisfaction of passengers on the public bus transport system. Marginal 17% of passengers were very dissatisfied while 57% of passengers were dissatisfied on the public transport system as a whole. 12% of passengers were

satisfied with the current public transport system Hence, it can be concluded that most (74%) of the respondents were not satisfied with the current public bus transport system as a whole.

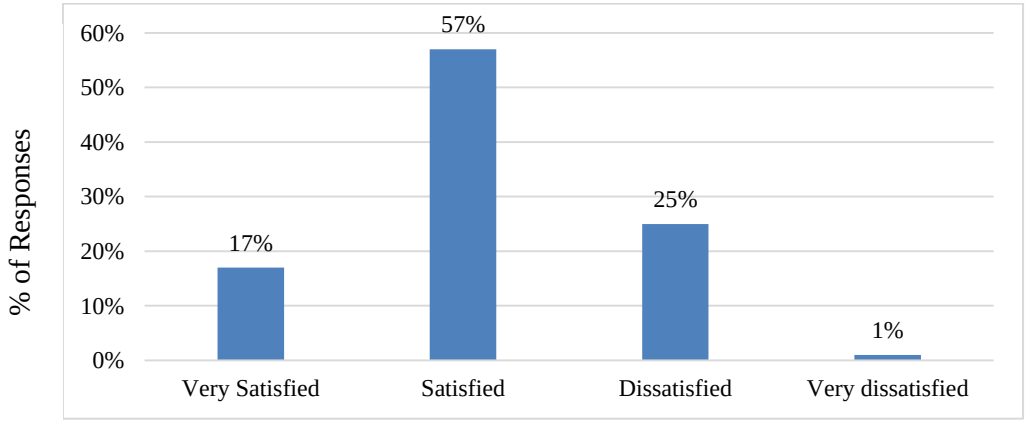

Figure 4.22: Overall satisfaction on public bus transport system

4.8 Summary of Chapter 4

The 56 characteristics of public bus transport as per the responses of the survey participants were classified into five major categories based on common characteristics. The five major categories are; (i) demographic and socioeconomic characteristics, (ii) characteristics of buses, (iii) characteristics of conductors, (iv) characteristics of drivers, and (v) common characteristics of public bus transport.

Exploratory data analysis found that (i) a clear majority of 74% of respondents were not satisfied with the current public bus transport system, (ii) more than three quarter of respondents were not satisfied with the actions of the government with respect to the public bus transport system, (iii) little more half of the respondents (58% and 63%) were not satisfied with the characteristics of drivers and conductors in the public bus transport system, respectively, and (iv) a majority of 60% of respondents were not satisfied with the characteristics of buses used in the public transport system.

CHAPTER 5

FACTORS FOR THE SATISFACTION OF PASSENGERS via FACTOR ANALYSIS (FA)

Chapter 5 provides the results on the satisfaction of passengers using public bus transport service in Kottawa – Pettah Route obtained using factor analysis (FA). It illustrates the results of the prerequisites for factor analysis, such as, reliability of questionnaire, significance of the correlation matrix and s, Kaiser–Meyer–Olkin measure of sampling adequacy. Different combination of factor extraction methods and orthogonal transformation are used to check the invariability condition of the factors extracted.

5.1 Correlation Matrix

The matrix of correlation-coefficients between variables is shown in Appendix 2. Of the 1081 pairs of correlations, almost half of pairs (48.6% or 525 pairs) are significant at 5% level as p-values are less than 0.05. Further, about 82% of pairs have positive correlations. Furthermore, the significance of Bartlett's Test of Sphericity (test statistic – 4184.9 and p =0.000) concluded that observed correlation matrix is significantly deviated from the normality (Table 5.1). Thus, it can be assumed that there are common factors related to those variables due the correlation among variables. To identify those common factors FA is used.

5.2 Adequacy Statistics for FA

Factor analysis requires the performance of reliability analysis for the variables to be used in each factor analysis. Initial system has 47 variables. Reliability statistics based on those variables are shown in Table 5.1. Cronbach`s alpha coefficient of 0.658 confirmed that there is good internal consistency in data.

Table 5.1: Results of Adequacy Statistics for FA

Statistic Measures		Value
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		0.723
Bartlett's Test of Sphericity	Approx. Chi-Square	4184.88
	Df	1081
	Sig.	0.000
Cronbach`s alpha coefficient		0.658

A Kaiser-Meyer-Olkin (KMO) test is used in research to determine the sampling adequacy of data that are to be used for FA. Social scientists often use FA to ensure that the variables they have used to measure a particular concept are measuring the concept intended. The KMO test allows us to ensure that the data we have are suitable to run a FA and therefore determine whether or not we have set out what we intended to measure. The statistic that is computed is a measure of 0 to 1. When this indicator closer to 1 it is better, however many authors have suggested the minimum value should be .6. The observed e KMO statistic (0.723) is greater than 0.6. It confirmed that data set is suitable for FA.

5.3 Initial Scanning of Variables

Component matrix after rotation is explained below. Moreover, variables which have loadings less than 0.5 are removed and factor analysis is carried out. Accordingly, the following variables are removed based on factor loadings.

- Crimes on the bus stands and inside buses,
- Receiving the correct balance money,
- Receiving courteous, polite and friendly service of conductors,
- Transacting with smartly and decently dressed bus conductors,
- Conductors moving forward and backward inside the bus,
- Giving adequate time to embark and disembark by conductors,
- Allowing passengers to be seated till bus comes to standstill for disembarking,
- Bus breaking down with passengers on board, and
- Number of passengers in buses

5.4 Eigen Analysis

The results of eigen analysis of the correlation matrix of the observed 37 variables are shown in Table 5.2. Based on the eigenvalues greater than one criterion it can be concluded that only the first fourteen components can be used as common factors and those fourteen common factors accounted for 63% of the variance across 37 observed variables. However, as the fifteen eigenvalue is close to one (0.944) and consequently fifteen common factor solutions accounted for 66% of the variance across 37 observed variables and one tends to select 15-factor model. Thus it can be concluded that the correlation among 37 variables have 15 common latent variables. In other words, variance covariance matrix of the 37 variables can be replaced by 15-D system.

Table 5.2: Total Variance and Eigenvalues

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	4.309	11.647	11.647	4.309	11.647	11.647
2	2.640	7.134	18.781	2.640	7.134	18.781
3	2.084	5.632	24.413	2.084	5.632	24.413
4	1.781	4.815	29.228	1.781	4.815	29.228
5	1.664	4.498	33.726	1.664	4.498	33.726
6	1.561	4.218	37.944	1.561	4.218	37.944
7	1.381	3.734	41.677	1.381	3.734	41.677
8	1.284	3.471	45.148	1.284	3.471	45.148
9	1.261	3.408	48.556	1.261	3.408	48.556
10	1.189	3.214	51.770	1.189	3.214	51.770
11	1.135	3.068	54.837	1.135	3.068	54.837
12	1.092	2.952	57.790	1.092	2.952	57.790
13	1.069	2.889	60.679	1.069	2.889	60.679
14	1.050	2.837	63.516	1.050	2.837	63.516
15	.944	2.551	66.067			
16	.919	2.484	68.551			
17	.857	2.317	70.868			
18	.824	2.228	73.096			
19	.797	2.155	75.251			
20	.758	2.049	77.300			
21	.725	1.959	79.259			
22	.676	1.827	81.086			
23	.641	1.732	82.819			
24	.617	1.668	84.486			
25	.604	1.631	86.118			
26	.586	1.583	87.701			
27	.553	1.495	89.196			
28	.508	1.374	90.569			
29	.487	1.316	91.885			
30	.463	1.252	93.138			
31	.451	1.220	94.358			
32	.421	1.136	95.494			
33	.386	1.042	96.537			
34	.366	.988	97.525			
35	.325	.880	98.405			
36	.314	.848	99.252			
37	.277	.748	100.000			

5.5 Bentler's Alpha

Bentler's alpha on internal reliability of each selected factor is provided in Table 5.3. Bentler's alpha for the initial fourteen factors are higher than zero. However, the alpha for 16^{th} factor is negative (less than zero), resulting it is not recommended to select factor 15. However, considering the eigen value very closer to unity (0.944), factor 15 is also included as a factor in further analysis.

Table 5.3: Bentler's Alpha of 15-Factor Model (PCF and Varimax)

Factor Number	Eigen Value	Bentler's Alpha
1	4.309	0.789
2	2.640	0.638
3	2.084	0.535
4	1.781	0.451
5	1.664	0.410
6	1.561	0.369
7	1.381	0.284
8	1.284	0.227
9	1.261	0.213
10	1.189	0.163
11	1.135	0.122
12	1.092	0.087
13	1.069	0.066
14	1.050	0.049
15	0.944	(0.061)

5.1.2 Factor loadings

The initial factor loadings should not be used to define factors and the initial factors have to be rotated through an orthogonal rotation method to define factors. In view of the above explanation, 15 factors extracted were rotated using three orthogonal rotation methods to get the meaningful factors and to check whether factors are invariant on the type of rotation. The factor loadings after the orthogonal rotation are shown in Table 5.4, Table 5.5 and Table 5.56respectively. The high loadings of each variable are highlighted.

Table 5.4: Factor loadings of 15-Factor Model (PCF and Varimax)

	Component														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Passenger.Harrasment	.033	-.002	.111	.098	.011	-.084	.045	-.106	.138	-.070	.794	-.052	-.034	-.034	.009
Crime.Bus.Stand	-.147	.032	-.108	-.166	.006	.135	.085	.001	-.098	.020	.764	.081	.011	.054	.054
Cond.Issuing.Tickets	-.022	.787	-.039	.002	.098	.038	.130	-.057	-.023	.064	-.019	-.024	-.036	-.024	.015
Cond.issu.ticb4Start	-.156	.574	.055	.288	.111	-.062	.113	-.051	.002	.020	.068	-.010	.057	-.184	.165
Info.in.ticket	-.015	.710	-.116	.009	.105	.022	-.120	.125	.141	.048	.036	-.065	.077	.106	-.137
Cond.CorrectFare	-.060	.693	-.006	-.254	-.036	.166	-.013	.030	.070	.072	-.022	.057	-.011	.142	.026
Cond.Intoxication	-.002	-.045	-.023	.835	.067	.052	-.104	-.055	-.041	.099	.008	.062	.039	-.039	.050
Cond.Betal	.059	.014	.021	.546	-.127	.043	-.044	-.062	.024	.048	.033	.647	-.075	.089	-.007
Cond.Haras	.088	.001	.133	.626	.143	.002	-.022	.272	-.015	-.190	-.112	.051	.065	-.062	-.146
Cond.2door	.147	.068	-.053	.020	-.070	.006	-.010	.778	.061	.022	-.042	.183	-.069	-.022	-.007
Cond.Uniform	-.091	.094	-.027	.098	.059	.837	.102	.069	.091	.047	-.029	-.042	-.139	-.042	.023
D.Driving	.752	-.146	-.029	-.011	-.028	-.013	-.019	.163	-.048	-.015	-.064	.074	.033	-.035	.062
D.RuleX	.798	-.088	.130	.085	-.076	-.016	-.051	.044	-.142	-.035	-.068	.067	-.076	-.015	-.063
D.Phone	.574	.063	.318	.101	.032	-.199	-.143	.047	-.038	.018	-.067	.088	-.104	-.029	-.123
D.Stop	.031	.081	-.079	-.065	.031	.045	.081	.098	-.100	.794	.012	.088	-.006	-.066	-.057
D.Stop.InOut	-.043	.091	.027	.059	.124	.072	-.047	.106	.081	.802	-.061	-.042	.026	.054	.069
D.Ask.2Door	.075	-.022	.065	.046	-.004	-.026	.024	.794	-.036	.196	-.060	-.049	.035	-.004	.045
D.Beha	-.061	.222	-.101	-.090	.700	.163	.242	.054	.079	.155	.021	.039	-.073	.045	.123
D.Nature	-.154	.166	-.145	.031	.702	.190	.123	-.064	.134	.126	.034	-.014	-.101	-.080	.121
D.Drunk	.076	-.040	.016	.295	.658	.009	-.143	-.064	-.034	-.050	-.029	.011	.196	.061	-.022
D.Betal	.215	-.053	.073	.062	.087	-.009	-.055	.174	.031	.012	-.033	.752	.104	.020	.076
D.Sound	.497	.029	-.003	-.199	-.039	-.064	-.068	.012	.078	.081	.232	.432	.180	-.095	-.098
D.Uniform	-.059	.061	-.026	-.030	.205	.833	.036	-.095	.087	.077	.063	.038	.074	.052	-.082
B.Hei.FB	.109	-.058	.244	-.168	-.125	.139	-.019	.069	-.239	-.106	-.238	.091	.409	-.193	.363
B.Dor.Wit	-.005	-.026	.625	.135	-.272	.012	.001	.071	-.038	-.090	-.085	.126	-.045	.001	.146
B.Height	-.165	.028	-.058	.046	.089	-.150	.034	-.019	.059	-.011	-.015	.179	.778	-.083	-.148
B.Seat.Wit	.049	-.157	.751	-.025	.077	-.051	-.143	-.043	-.013	.037	.017	.084	-.090	.058	.035
B.Sit.Leg	-.199	-.060	-.700	.006	.067	.007	.119	-.004	-.009	.025	-.070	.117	-.047	.002	.151
B.S.H.Rest	.206	.098	-.197	.180	-.092	.122	.153	-.059	.185	.134	.056	-.261	.528	.186	.126
B.Clean	-.105	.113	-.134	-.031	.112	.163	.678	.128	-.052	.070	.036	.006	.129	.071	-.175
BusHaltAvailability	.028	.144	-.204	.065	-.131	.025	.344	-.210	.467	.073	-.136	-.055	-.011	.060	.225
BusHaltCleaness	-.086	-.024	-.123	-.111	.055	.006	.782	-.072	.084	-.033	.108	-.088	-.022	.047	.048
HaltDistance	-.166	.090	.132	-.013	.043	.024	.037	-.050	-.076	-.079	-.013	.055	-.087	.842	-.030
BusAvailability	.172	-.030	-.195	-.141	-.049	-.041	.225	.048	.328	.166	.070	-.045	.126	.497	.103
DoorClosed	-.099	.019	-.016	-.019	.158	-.062	-.059	.028	.043	.023	.074	.029	-.063	.024	.808
PoliceEnforcement	-.199	.031	.068	.002	.123	.107	.154	-.001	.686	.023	-.061	.194	-.020	-.066	-.181
ComplaintHandling	-.064	.100	-.016	-.084	.096	.115	-.187	.100	.701	-.102	.178	-.074	.121	.047	.116

Table 5.5: Factor loadings 0f 15-Factor Model (PCF and Quartimax)

	Component														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Passenger.Harrasment	.030	-.002	.110	.096	.012	-.084	.047	.139	-.107	-.070	.794	-.054	-.036	-.035	.008
Crime.Bus.Stand	-.148	.033	-.110	-.167	.007	.134	.084	-.097	.002	.020	.764	.082	.012	.053	.053
Cond.Issuing.Tickets	-.024	.788	-.039	.002	.096	.034	.127	-.027	-.057	.060	-.021	-.023	-.038	-.026	.014
Cond.issu.ticb4Start	-.157	.574	.056	.289	.108	-.065	.111	-.002	-.051	.018	.067	-.009	.056	-.184	.164
Info.in.ticket	-.014	.711	-.116	.010	.102	.018	-.122	.138	.125	.044	.035	-.065	.074	.104	-.138
Cond.CorrectFare	-.060	.694	-.006	-.254	-.038	.163	-.015	.067	.030	.069	-.023	.060	-.012	.140	.025
Cond.Intoxication	-.002	-.045	-.022	.835	.066	.052	-.103	-.040	-.055	.100	.009	.059	.035	-.037	.051
Cond.Betal	.068	.013	.024	.548	-.127	.043	-.044	.025	-.062	.049	.035	.644	-.073	.091	-.006
Cond.Haras	.091	.000	.134	.628	.141	.002	-.020	-.015	.271	-.190	-.110	.047	.065	-.059	-.144
Cond.2door	.154	.068	-.051	.021	-.070	.006	-.011	.061	.777	.021	-.041	.181	-.069	-.023	-.007
Cond.Uniform	-.098	.098	-.028	.098	.061	.836	.102	.090	.070	.047	-.029	-.040	-.142	-.043	.022
D.Driving	.754	-.146	-.031	-.009	-.026	-.008	-.014	-.045	.159	-.015	-.063	.061	.028	-.034	.066
D.RuleX	.800	-.090	.129	.086	-.074	-.011	-.046	-.139	.039	-.035	-.067	.054	-.080	-.013	-.058
D.Phone	.578	.061	.319	.101	.032	-.195	-.139	-.036	.043	.018	-.066	.078	-.105	-.027	-.120
D.Stop	.033	.085	-.081	-.065	.032	.045	.081	-.100	.098	.793	.012	.088	-.006	-.067	-.058
D.Stop.InOut	-.043	.096	.024	.059	.125	.070	-.046	.082	.106	.801	-.061	-.042	.024	.053	.068
D.Ask.2Door	.080	-.021	.064	.047	-.004	-.025	.025	-.035	.793	.196	-.059	-.052	.035	-.003	.046
D.Beha	-.065	.227	-.103	-.089	.701	.159	.240	.077	.054	.152	.020	.041	-.073	.043	.121
D.Nature	-.160	.171	-.146	.031	.702	.186	.120	.131	-.063	.123	.033	-.010	-.101	-.082	.117
D.Drunk	.076	-.038	.015	.298	.657	.009	-.142	-.033	-.065	-.050	-.028	.006	.196	.064	-.021
D.Betal	.228	-.053	.074	.065	.088	-.007	-.054	.033	.173	.013	-.031	.746	.109	.022	.078
D.Sound	.507	.029	-.004	-.196	-.037	-.061	-.067	.080	.010	.080	.233	.423	.181	-.094	-.096
D.Uniform	-.063	.066	-.029	-.030	.207	.832	.036	.088	-.095	.077	.062	.038	.072	.051	-.082
B.Hei.FB	.114	-.060	.243	-.165	-.124	.142	-.017	-.235	.068	-.104	-.237	.085	.412	-.189	.367
B.Dor.Wit	-.001	-.028	.627	.134	-.271	.013	.005	-.036	.070	-.087	-.083	.124	-.041	.003	.148
B.Height	-.155	.029	-.061	.051	.086	-.150	.033	.061	-.019	-.010	-.014	.174	.782	-.080	-.146
B.Seat.Wit	.053	-.158	.752	-.025	.079	-.049	-.138	-.011	-.044	.040	.018	.081	-.085	.061	.036
B.Sit.Leg	-.201	-.059	-.700	.006	.067	.005	.114	-.011	-.002	.023	-.071	.124	-.048	.000	.148
B.S.H.Rest	.202	.102	-.205	.181	-.093	.123	.155	.191	-.062	.134	.056	-.269	.518	.185	.129
B.Clean	-.107	.117	-.139	-.031	.112	.161	.677	-.053	.129	.068	.036	.008	.129	.069	-.176
BusHaltAvailability	.020	.147	-.208	.063	-.130	.023	.344	.468	-.210	.072	-.137	-.054	-.019	.054	.222
BusHaltCleaness	-.093	-.021	-.128	-.113	.056	.005	.781	.083	-.071	-.034	.107	-.085	-.025	.044	.046
HaltDistance	-.166	.091	.130	-.015	.042	.023	.039	-.072	-.050	-.077	-.012	.057	-.086	.842	-.031
BusAvailability	.169	-.026	-.201	-.142	-.048	-.041	.227	.333	.047	.166	.069	-.048	.119	.493	.102
DoorClosed	-.103	.020	-.017	-.020	.160	-.063	-.060	.045	.028	.023	.073	.031	-.065	.023	.807
PoliceEnforcement	-.199	.035	.067	.002	.125	.104	.153	.683	.000	.022	-.062	.198	-.019	-.071	-.185
ComplaintHandling	-.067	.104	-.018	-.084	.096	.113	-.187	.702	.100	-.102	.176	-.074	.117	.043	.114

Table 5.6: Factor loadings of 15-Factor Model (PCF and Equamax)

	Component														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Passenger.Harrasment	-.007	.047	.106	.120	.007	-.084	.038	-.102	-.043	-.071	.131	.794	-.022	-.027	.012
Crime.Bus.Stand	.022	-.144	-.157	-.099	.000	.140	.089	-.003	.072	.023	-.104	.766	.009	.061	.060
Cond.Issuing.Tickets	.781	-.013	.003	-.037	.108	.058	.142	-.055	-.035	.088	.001	-.012	-.023	-.005	.027
Cond.issu.ticb4Start	.571	-.147	.287	.055	.120	-.043	.124	-.051	-.021	.035	.022	.071	.065	-.176	.175
Info.in.ticket	.700	-.020	.006	-.114	.121	.040	-.110	.128	-.068	.069	.154	.043	.094	.122	-.126
Cond.CorrectFare	.683	-.062	-.251	-.003	-.030	.182	-.006	.030	.046	.090	.079	-.015	-.005	.162	.037
Cond.Intoxication	-.047	.000	.832	-.025	.073	.053	-.109	-.050	.072	.092	-.043	.000	.055	-.058	.043
Cond.Betal	.019	.020	.546	.006	-.125	.041	-.046	-.060	.652	.042	.025	.024	-.082	.078	-.014
Cond.Haras	.007	.072	.616	.124	.154	.001	-.025	.278	.068	-.194	-.010	-.119	.066	-.084	-.156
Cond.2door	.066	.114	.014	-.063	-.070	.004	-.007	.781	.191	.026	.063	-.044	-.070	-.021	-.012
Cond.Uniform	.071	-.056	.101	-.020	.043	.845	.102	.067	-.055	.052	.096	-.026	-.124	-.030	.033
D.Driving	-.140	.736	-.021	-.024	-.033	-.036	-.036	.184	.132	-.018	-.069	-.071	.055	-.044	.033
D.RuleX	-.075	.782	.077	.129	-.078	-.041	-.071	.067	.127	-.038	-.158	-.077	-.059	-.032	-.096
D.Phone	.076	.551	.095	.310	.035	-.214	-.159	.065	.133	.017	-.042	-.074	-.103	-.044	-.145
D.Stop	.061	.019	-.062	-.068	.021	.047	.084	.096	.088	.800	-.094	.012	-.002	-.055	-.052
D.Stop.InOut	.062	-.041	.064	.044	.114	.076	-.053	.105	-.041	.802	.076	-.060	.040	.065	.077
D.Ask.2Door	-.030	.052	.042	.066	-.005	-.029	.020	.796	-.037	.194	-.043	-.064	.036	-.009	.038
D.Beha	.195	-.042	-.090	-.087	.693	.183	.252	.050	.028	.172	.092	.029	-.070	.061	.146
D.Nature	.141	-.125	.030	-.137	.694	.213	.138	-.070	-.033	.143	.153	.043	-.096	-.064	.147
D.Drunk	-.049	.069	.283	.022	.665	.015	-.144	-.060	.031	-.049	-.039	-.032	.192	.040	-.023
D.Betal	-.051	.150	.050	.061	.085	-.015	-.056	.177	.773	.008	.024	-.041	.076	.006	.065
D.Sound	.031	.449	-.211	-.002	-.041	-.078	-.074	.024	.474	.083	.069	.227	.175	-.096	-.115
D.Uniform	.034	-.039	-.033	-.011	.192	.839	.033	-.097	.037	.081	.083	.065	.080	.058	-.075
B.Hei.FB	-.051	.084	-.183	.250	-.127	.126	-.029	.073	.119	-.117	-.259	-.247	.387	-.219	.340
B.Dor.Wit	-.013	-.020	.138	.617	-.275	.001	-.018	.075	.137	-.106	-.048	-.095	-.067	-.019	.132
B.Height	.022	-.215	.024	-.040	.105	-.149	.036	-.023	.195	-.015	.049	-.019	.760	-.096	-.153
B.Seat.Wit	-.151	.034	-.022	.744	.071	-.061	-.164	-.039	.102	.020	-.025	.008	-.124	.034	.025
B.Sit.Leg	-.068	-.187	.008	-.700	.066	.020	.143	-.015	.086	.035	.001	-.063	-.031	.021	.168
B.S.H.Rest	.074	.221	.173	-.155	-.088	.116	.131	-.048	-.224	.129	.150	.054	.578	.195	.117
B.Clean	.094	-.097	-.030	-.110	.110	.173	.684	.123	-.005	.078	-.045	.040	.137	.089	-.164
BusHaltAvailability	.125	.066	.071	-.183	-.140	.031	.338	-.207	-.063	.078	.464	-.128	.034	.098	.241
BusHaltCleaness	-.040	-.051	-.102	-.096	.045	.014	.783	-.077	-.104	-.027	.088	.115	-.003	.077	.064
HaltDistance	.081	-.166	.003	.144	.051	.029	.021	-.052	.049	-.088	-.104	-.017	-.088	.837	-.029
BusAvailability	-.056	.184	-.135	-.161	-.054	-.044	.205	.055	-.028	.161	.294	.071	.166	.522	.106
DoorClosed	.010	-.075	-.012	-.010	.146	-.056	-.064	.028	.025	.020	.026	.074	-.052	.027	.815
PoliceEnforcement	.011	-.195	.001	.071	.114	.119	.157	-.008	.173	.027	.701	-.053	-.016	-.034	-.153
ComplaintHandling	.078	-.048	-.087	-.005	.090	.122	-.195	.102	-.073	-.100	.690	.185	.147	.074	.134

It should be recalled that factor loadings are the correlations between the original variables and the common factors. It can be seen in Table 5.4. The same trend can be seen in the factor loadings in Table 5.5 and Table 5.6. Results of the three Tables are summarized in Table 5.7.

Table 5.7: List of Variables Selected for the 15 Factors

Component	Varimax	Quartimax	Equamax
1	D.Driving D.RuleX D.Phone	D.Driving D.RuleX D.Phone D.Sound	D.Driving D.RuleX D.Phone
2	Cond.Issuing.Tickets Cond.issu.ticb4Start Info.in.ticket Cond.CorrectFare	Cond.Issuing.Tickets Cond.issu.ticb4Start Info.in.ticket Cond.CorrectFare	Cond.Issuing.Tickets Cond.issu.ticb4Start Info.in.ticket Cond.CorrectFare
3	B.Dor.Wit B.Seat.Wit B.Sit.Leg	B.Dor.Wit B.Seat.Wit B.Sit.Leg	B.Dor.Wit B.Seat.Wit B.Sit.Leg
4	Cond.Intoxication Cond.Haras	Cond.Intoxication Cond.Haras	Cond.Intoxication Cond.Haras
5	D.Beha D.Nature D.Drunk	D.Beha D.Nature D.Drunk	D.Beha D.Nature D.Drunk
6	Cond.Uniform D.Uniform	Cond.Uniform D.Uniform	Cond.Uniform D.Uniform
7	B.Clean BusHaltCleaness	B.Clean BusHaltCleaness	B.Clean BusHaltCleaness
8	Cond.2door D.Ask.2Door	Cond.2door D.Ask.2Door	Cond.2door D.Ask.2Door
9	BusHaltAvailability PoliceEnforcement ComplaintHandling	BusHaltAvailability PoliceEnforcement ComplaintHandling	BusHaltAvailability PoliceEnforcement ComplaintHandling
10	D.Stop D.Stop.InOut	D.Stop D.Stop.InOut	D.Stop D.Stop.InOut
11	Passenger.Harrasment Crime.Bus.Stand	Passenger.Harrasment Crime.Bus.Stand	Passenger.Harrasment Crime.Bus.Stand
12	Cond.Betal D.Betal D.Sound	Cond.Betal D.Betal	Cond.Betal D.Betal D.Sound
13	B.Hei.FB B.Height B.S.H.Rest	B.Hei.FB B.Height B.S.H.Rest	B.Hei.FB B.Height B.S.H.Rest
14	HaltDistance BusAvailability	HaltDistance BusAvailability	HaltDistance BusAvailability
15	DoorClosed	DoorClosed	DoorClosed

It is seen that variables identified under Varimax rotation and Equamax rotation are almost similar. However, some minor differences can be seen between factor loadings of Varimax and Equamax rotation methods and Quartimax rotation. Accordingly, it can be concluded that

the 15-factor model obtained using PCF and Varimax rotation is invariant of the type of rotation. Since, Varimax rotation is the most popular and widely used rotation method, the results using Varimax rotation is selected for explanation.

5.1.3 Naming the Factors

The next step is to identify common themes based on the content of questions in each factor. Common subjects among highly loading questions can help to identify the constructs, if the mathematical factor represents some real world constructs. Extracted 15 factors, and their respective statements and names are shown in Table 5.8.

Table 5.8: Naming Factors

Questions	Factor No.	Factor Name
Drivers using mobile phones while driving	Factor 1	Driving
Drivers breaking road rules while driving		
Speeding, reckless and dangerous bus driving		
Playing audio/video with high volume		
Issuing Tickets to passengers	Factor 2	Ticketing
Issuing tickets before the bus leave the bus stand (Bentler, 1968)		
Issuing tickets for the correct bus fare		
Issuing tickets depicting the location of embarking and disembarking, the ticket fare date, and the number of the bus		
The width of seats in buses	Factor 3	Door & Seat Sizes
Length of leg and foot space in buses		
The width of doors in buses		
Transacting with intoxicated (drunken) conductors	Factor 4	Conductors' Habits
Harassment/bullying by conductors		
Experiencing intoxicated drivers while driving	Factor 5	Drivers' Habits
Frequency of receiving friendly, courteous, polite and welcoming service from drivers		
Frequency of travelling by bus driven by a well-mannered, smartly and decently dressed drivers		
Conductors wearing uniform	Factor 6	Uniform
Drivers wearing uniform		
Cleanness of bus stands & halts	Factor 7	Cleanness
Cleanness of buses		
Drivers asking Passengers to embark and disembark through both doors	Factor 8	Embarking & Disembarking
Conductors asking Passengers to embark and disembark through both doors		
Availability of passenger complaint handling process	Factor 9	Law Enforcement
Imposing Laws relevant to public transport against offenders by the Police		
Availability of Bus Halts and Stands for passengers to wait		
Keeping the bus stopped till all passengers disembark and embark	Factor 10	Safety
Stopping buses at the appropriate place of the bus halt for passengers to embark and disembark		
Frequency of harassment by co-passengers	Factor 11	Harassments & Crimes
Crimes on the bus stands and inside buses		

Table 5.7: Naming Factors (Continued…)

Transacting with betel chewing conductors	Factor 12	Crew Behaviour
Seeing driver chewing betel while driving		
Height of the foot board	Factor 13	Seat & On Board Heights
Height of head rests of seats in buses		
On board Ceiling height		
Distance between two nearby bus stops	Factor 14	Convenience
Are buses available when needed		
Are doors of the bus kept closed while running	Factor 15	Open Doors

The initial and final communalities are shown in Table 5.9.

Table 5.9: Final Communalities

	Initial	Extraction
Passenger.Harrasment	1.000	.703
Crime.Bus.Stand	1.000	.694
Cond.Issuing.Tickets	1.000	.661
Cond.issu.ticb4Start	1.000	.541
Info.in.ticket	1.000	.622
Cond.CorrectFare	1.000	.613
Cond.Intoxication	1.000	.741
Cond.Betal	1.000	.762
Cond.Haras	1.000	.593
Cond.2door	1.000	.684
Cond.Uniform	1.000	.782
D.Driving	1.000	.634
D.RuleX	1.000	.720
D.Phone	1.000	.549
D.Stop	1.000	.693
D.Stop.InOut	1.000	.711
D.Ask.2Door	1.000	.693
D.Beha	1.000	.705
D.Nature	1.000	.687
D.Drunk	1.000	.600
D.Betal	1.000	.683
D.Sound	1.000	.602
D.Uniform	1.000	.790
B.Hei.FB	1.000	.613
B.Dor.Wit	1.000	.545
B.Height	1.000	.736
B.Seat.Wit	1.000	.644
B.Sit.Leg	1.000	.597
B.S.H.Rest	1.000	.627
B.Clean	1.000	.620
BusHaltAvailability	1.000	.547
BusHaltCleaness	1.000	.687
HaltDistance	1.000	.792
BusAvailability	1.000	.561
DoorClosed	1.000	.710
PoliceEnforcement	1.000	.645
ComplaintHandling	1.000	.658

5.2 Defining Factors

In order to define the factors, factor score coefficients were obtained via PCF and Varimax rotation (Table 5.10).

Table 5.10: Factor Score Coefficients (PCF and Varimax)

	Component														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Passenger.Harrasment	.050	-.006	.092	.109	-.014	-.057	.042	-.001	.065	-.013	.560	-.092	-.025	-.067	.012
Crime.Bus.Stand	-.057	-.005	-.037	-.050	-.040	.092	-.009	.074	-.166	-.002	.537	.074	.036	.026	.045
Cond.Issuing.Tickets	.057	.403	.017	.007	-.018	-.039	.071	-.067	-.086	-.030	-.032	.009	-.050	-.058	.012
Cond.issu.ticb4Start	-.041	.293	.081	.169	-.022	-.100	.109	-.034	-.044	-.019	.052	-.015	.022	-.183	.142
Info.in.ticket	.028	.342	-.065	.003	.002	-.033	-.165	.081	.031	-.046	.021	-.060	.045	.078	-.126
Cond.CorrectFare	.004	.345	.014	-.144	-.090	.073	-.078	-.005	-.029	-.026	-.044	.088	-.007	.088	.016
Cond.Intoxication	-.009	-.029	-.055	.473	-.052	.035	-.041	-.053	-.028	.096	.057	-.055	.007	.010	.065
Cond.Betal	-.046	.029	-.065	.262	-.159	.033	.017	-.112	.002	.044	.023	.439	-.103	.091	.022
Cond.Haras	.004	.008	.044	.322	.074	-.003	.064	.195	.008	-.159	-.022	-.074	.034	-.009	-.104
Cond.2door	-.020	.027	-.072	-.001	-.046	.000	.001	.520	.049	-.088	.028	.062	-.079	-.007	.003
Cond.Uniform	.023	-.011	.004	.064	-.095	.534	-.002	.045	.002	-.037	-.011	-.042	-.092	-.059	.025
D.Driving	.382	-.030	-.086	-.019	.042	.054	.036	.028	.001	-.048	-.015	-.045	-.011	-.009	.086
D.RuleX	.408	.023	-.010	.034	.017	.062	.056	-.065	-.047	-.033	-.014	-.058	-.085	.011	-.011
D.Phone	.265	.083	.124	.021	.088	-.103	.013	-.051	.042	.025	-.026	-.032	-.099	-.011	-.083
D.Stop	-.019	-.022	.013	-.028	-.049	-.026	.022	-.036	-.082	.554	.023	.052	-.011	-.079	-.072
D.Stop.InOut	-.044	-.045	.082	.044	-.005	-.024	-.085	-.014	.048	.564	-.027	-.073	.025	.031	.027
D.Ask.2Door	-.055	-.043	.045	.036	.003	-.030	.035	.542	-.016	.058	.038	-.130	.034	.021	.038
D.Beha	.044	.019	.033	-.096	.410	-.026	.122	.031	-.026	.000	-.028	.043	-.072	.014	.067
D.Nature	.011	-.010	-.010	-.028	.390	-.001	.029	-.037	.033	.009	-.017	.005	-.098	-.091	.063
D.Drunk	.065	-.067	.010	.089	.435	-.041	-.108	-.038	-.058	-.070	-.020	-.056	.159	.110	-.037
D.Betal	-.001	-.018	-.016	-.070	.060	-.007	.008	.033	.004	-.037	-.038	.527	.044	.038	.074
D.Sound	.206	.041	-.043	-.165	.005	-.011	-.031	-.078	.050	.040	.147	.275	.102	-.092	-.074
D.Uniform	.038	-.044	.017	-.041	.022	.531	-.080	-.074	-.031	-.006	.029	.026	.088	.033	-.078
B.Hei.FB	.008	.012	.144	-.135	-.055	.162	.047	.013	-.172	-.084	-.138	.061	.353	-.128	.329
B.Dor.Wit	-.078	.030	.363	.068	-.161	.042	.145	.032	.021	-.012	-.034	.054	.000	.000	.148
B.Height	-.152	-.010	.033	-.033	.060	-.105	.000	-.007	-.011	-.002	-.017	.126	.607	-.045	-.146
B.Seat.Wit	-.041	-.073	.449	-.059	.114	-.030	.036	-.050	.051	.096	.016	.014	-.014	.057	.026
B.Sit.Leg	-.063	-.057	-.424	.017	-.010	-.023	-.038	.012	-.058	-.041	-.074	.168	-.088	.004	.121
B.S.H.Rest	.165	.015	-.051	.162	-.121	.095	.027	-.047	.056	.075	.054	-.261	.398	.157	.117
B.Clean	-.021	.006	.063	.011	.033	.026	.472	.102	-.125	-.024	.009	.033	.086	.012	-.158
BusHaltAvailability	.100	.042	-.043	.091	-.159	-.041	.207	-.171	.312	.042	-.152	-.013	-.080	-.032	.189
BusHaltCleaness	.034	-.050	.087	.000	.021	-.079	.572	-.016	.001	-.059	.030	-.008	-.050	-.043	.034
HaltDistance	-.085	.024	.077	.009	.049	-.001	-.025	.006	-.145	-.076	-.039	.074	-.013	.753	-.025
BusAvailability	.121	-.069	-.058	-.026	-.035	-.057	.070	.025	.168	.081	.013	-.045	.074	.392	.080
DoorClosed	-.020	-.006	-.008	.001	.065	-.059	-.056	.035	-.003	-.018	.046	.033	-.053	.025	.689
PoliceEnforcement	-.103	-.062	.120	-.035	.030	-.030	.091	-.008	.496	.010	-.113	.155	-.067	-.142	-.192
ComplaintHandling	-.001	-.014	.014	-.047	.020	.038	-.225	.112	.478	-.098	.089	-.090	.069	-.007	.073

Based on the results in Table 5.9, extracted 15 factors can be expressed as follows

Factor 1 = $0.382 * Z_{D.Driving} + 0.408 * Z_{D.RuleX} + 0.265 * Z_{D.Phone}$

Factor 2 = $0.403 * Z_{Cond.Isuing.Tickets} + 0.293 * Z_{Cond.issu.ticb4Start} + 0.342 * Z_{Info.in.ticket} + 0.342 * Z_{Cond.CorrectFare}$

Factor 3 = $0.363 * Z_{B.Dor.Wit.N} + 0.449 * Z_{B.Seat.Wit} - 0.424 * Z_{B.Sit.Leg}$

Factor 4 = $0.473 * Z_{Cond.Intoxication} + 0.322 * Z_{Cond.Haras}$

Factor 5 = $0.410 * Z_{D.Beha} + 0.390 * Z_{D.Nature} + 0.435 * Z_{D.Drunk}$

Factor 6 = $0.531 * Z_{D.Uniform} + 0.534 * Z_{Cond.Uniform}$

Factor 7 = $0.472 * Z_{B.Clean} + 0.572 * Z_{BusHaltCleaness}$

Factor 8 = $0.542 * Z_{D.Ask.2Door} + 0.520 * Z_{Cond.2Door}$

Factor 9 = $0.312 * Z_{BusHaltAvailability} + 0.496 * Z_{PoliceEnforcement} + 0.478 * Z_{PoliceEnforcement}$

Factor 10 = $0.554 * Z_{D.Stop} + 0.564 * Z_{D.Stop.InOut}$

Factor 11 = $0.560 * Z_{Passenger.Harrasment} + 0.537 * Z_{Crime.Bus.Stand}$

Factor 12 = $0.439 * Z_{Cond.Harras} + 0.527 * Z_{D.Betel} + 0.275 * Z_{D.Sound}$

Factor 13 = $0.353 * Z_{B.Hei.FB} + 0.607 * Z_{B.Height} + 0.398 * Z_{B.S.H.Rest}$

Factor 14 = $0.753 * Z_{HaltDistance} + 0.392 * Z_{BusAvailability}$

Factor 15 = $0.689 * Z_{DoorClosed}$

Accordingly, the operators of public bus transport should concentrate and improve the above 15 factors to improve the satisfaction of passengers using public bus transport system.

5.3 Summary of Chapter 5

Chapter 5 discusses the empirical results of the factor analysis on the factors determining the satisfaction of passengers using public bus transport service in Kottawa – Pettah Route. Accordingly, 15 factors are extracted as the determinants of passenger satisfaction. These 15 factors can be used to determine the satisfaction of passengers.

CHAPTER 6

CONCLUSIONS AND RECOMMENDATIONS

Based on the results of data analyses in Chapter 4 and Chapter 5, the following conclusions and recommendations are given.

6.1 Conclusions

Most of the passengers (74%) using public bus transport in Kottawa – Pettah Route is dissatisfied with the current public bus transport system as a whole.

FA identified 15 factors; Driving, Ticketing, Door & Seat Sizes, Conductors' Habits, Drivers' Habits, Uniform, Cleanness, Embarking & Disembarking, Law Enforcement, Safety, Harassments & Crimes, Crew Behaviour, Seat & On Board Height, Convenience, and open doors as factors determining the satisfaction of passengers using the public bus transport in Kottawa – Pettah Route.

The percentages of dissatisfaction of passengers on all four characteristics of public bus transport system are;

Characteristics of buses - 60%
Characteristics of conductors - 63%
Characteristics of drivers - 60%
Actions of the Government - 77%

A clear majority of 89% of passenger found the public buses as overcrowded and 62% of passengers experienced non-availability of buses when needed.

6.2 Recommendations

As majority of passengers (71 per cent) are not satisfied with the enforcement of law on the current public bus transport system by government agencies, the implementation of current Laws on public road transport should be tightly monitored to improve the efficiency and effectiveness, which will in turn improve the satisfaction of all stakeholders.

Since, 62 per cent, 89 percent of respondents, respectively, answered as buses are not available when in need and buses are overcrowded, number of buses on service should be increased to meet the increase in passenger demand and to attract the passengers using other modes of transport.

The operations of buses should be converted from timetable based system to a demand derived timetable based system, as buses are not available when needed (62 per cent of respondents).

As 60 per cent of respondents are not satisfied with the current characteristics of buses, different modes of operations of the buses (E.g.; Air-conditioned Normal Service, Air-conditioned Intercity Express Service, and Normal Intercity Express Service), in addition to the current normal bus service, should be designed and implemented to satisfy the demands of different types of passengers at differing fare structures.

Since, majority of respondents are not satisfied with the characteristics of conductors, introduce conductor less bus service, as in the case of developed countries, for example; Switzerland and the USA.

As respondents are not satisfied with the actions of the government, the laws and regulations governing the operations of the public bus transport system should be strengthened to protect the interests of passengers, other road users, drivers, conductors, operators and other stakeholders.

Though, only FA was carried out in this study, it is better to apply structural equation modelling to get better meaningful factors.

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Appendices

Appendix 1: Questionnaire

Questionnaire on Satisfaction of Passengers in using Public Bus Transport in Kottawa – Pettah Route

Socioeconomic Information

1. Gender

   Mark only one oval

   - ⬭ Male
   - ⬭ Female

2. Age (in Years)

   ---

3. Height (in Inches)

   ---

4. Weight (in Kilograms)

   ---

5. Marital Status

   Mark only one oval

   - ⬭ Single
   - ⬭ Married
   - ⬭ Split/Divorced/Widow

6. Do you own a private passenger vehicle?

   Mark only one oval

   - ⬭ Yes
   - ⬭ No

7. Your Work Place

   Mark only one oval

   - ⬭ Government sector
   - ⬭ Semi-Government
   - ⬭ Private Sector
   - ⬭ NGO
   - ⬭ None

8. Income Level

Mark only one oval

- ⬭ No Income
- ⬭ Less than Rs. 300,000 per annum
- ⬭ Between Rs. 300,000 & Rs. 600,000 per annum
- ⬭ Between Rs. 600,000 & Rs. 900,000 per annum
- ⬭ Between Rs. 900,000 & Rs. 1,200,000 per annum
- ⬭ Above Rs. 1,200,000 per annum

9. Time spend (in Minutes) on bus on a one way trip per day

---

10. Travel distance (in Kilometers) by bus on a one way trip per day

---

Physical Characteristics of Buses

11. Heights of Foot Boards

Mark only one oval

- ▢ Tall
- ▢ Right Height
- ▢ Short

12. Width of Bus Doors

Mark only one oval

- ▢ Large
- ▢ Right Width
- ▢ Small

13. On Board Ceiling Height

Mark only one oval

- ▢ Tall
- ▢ Right Height
- ▢ Short

14. Width of Seats

Mark only one oval

- ▢ Large
- ▢ Right Width
- ▢ Small

15. Length of Leg & Foot Space

Mark only one oval

- ▢ Long
- ▢ Right Size
- ▢ Short

16. Height of Seat Head Rest

Mark only one oval

- ▢ Tall
- ▢ Right Height
- ▢ Short

17. Cleanness of Buses

Mark only one oval

- ▢ Clean
- ▢ Not Clean

18. Frequency of bus breaking down with passengers on board

Mark only one oval

- Most of the times
- Sometimes
- Few times

Characteristics of Conductors

19. Frequency of issuing tickets to passengers

Mark only one oval

- ▢ Most of the times
- ▢ Sometimes
- ▢ Few times

20. Frequency of issuing tickets to passengers before the bus leaves the bus stand/halt

Mark only one oval

- ▢ Most of the times
- ▢ Sometimes
- ▢ Few times

21. Frequency of issuing tickets depicting the location of embarking and disembarking, the ticket fare date, and the number of the bus to passengers

Mark only one oval

- ▢ Most of the times
- ▢ Sometimes
- ▢ Few times

22. Frequency of issuing tickets for the correct bus fare

Mark only one oval

- ▢ Most of the times
- ▢ Sometimes
- ▢ Few times

23. Frequency of receiving the correct balance money

Mark only one oval

- ▢ Most of the times
- ▢ Sometimes
- ▢ Few times

24. Frequency of receiving courteous, polite and friendly service of conductors

Mark only one oval

- ▢ Most of the times
- ▢ Sometimes
- ▢ Few times

25. Frequency of transacting with intoxicated (drunken) conductors

Mark only one oval

- ⬭ Most of the times
- ⬭ Sometimes
- ⬭ Few times

26. Frequency of transacting with betel chewing conductors

Mark only one oval

- ⬭ Most of the times
- ⬭ Sometimes
- ⬭ Few times

27. Frequency of transacting with smartly and decently dressed bus conductors

Mark only one oval

- ⬭ Most of the times
- ⬭ Sometimes
- ⬭ Few times

28. Frequency of harassment/bullying by conductors

Mark only one oval

- ⬭ Most of the times
- ⬭ Sometimes
- ⬭ Few times

29. Frequency of Conductors moving forward and backward inside the bus

Mark only one oval

- ⬭ Most of the times
- ⬭ Sometimes
- ⬭ Few times

30. Frequency of giving adequate time to embark and disembark by conductors

Mark only one oval

- ⬭ Most of the times
- ⬭ Sometimes
- ⬭ Few times

31. Frequency of conductors asking Passengers to embark and disembark through both doors

Mark only one oval

- Most of the times
- Sometimes
- Few times

32. Frequency of allowing passengers to be seated till bus comes to standstill for disembarking

Mark only one oval

- Most of the times
- Sometimes
- Few times

33. Frequency of experiencing conductors wearing uniform

Mark only one oval

- Most of the times
- Sometimes
- Few times

Characteristics of Drivers

34. Frequency of experiencing speeding, reckless and dangerous bus driving

Mark only one oval

- Most of the times
- Sometimes
- Few times

35. Frequency of experiencing drivers breaking road rules while driving

Mark only one oval

- Most of the times
- Sometimes
- Few times

36. Frequency of experiencing drivers using mobile phones while driving

Mark only one oval

- Most of the times
- Sometimes
- Few times

37. Frequency of experiencing stopping buses at the appropriate place of the bus halt for passengers to embark and disembark

Mark only one oval

- Most of the times
- Sometimes
- Few times

38. Frequency of keeping the bus stopped till all passengers disembark and embark

Mark only one oval

- Most of the times
- Sometimes
- Few times

39. Frequency of experiencing drivers asking passengers to embark and disembark through both doors

Mark only one oval

- Most of the times
- Sometimes
- Few times

40. Frequency of receiving friendly, courteous, polite and welcoming service from drivers

Mark only one oval

- Most of the times
- Sometimes
- Few times

41. Frequency of travelling by bus driven by a well-mannered, smartly and decently dressed drivers

Mark only one oval

- Most of the times
- Sometimes
- Few times

42. Frequency of experiencing intoxicated drivers while driving

Mark only one oval

- Most of the times
- Sometimes
- Few times

43. Frequency of seeing driver chewing betel while driving

Mark only one oval

- Most of the times
- Sometimes
- Few times

44. Frequency of playing audio/video with high volume

Mark only one oval

- Most of the times
- Sometimes
- Few times

45. Frequency of drivers wearing uniform

Mark only one oval

- Most of the times
- Sometimes
- Few times

Actions of the Government on Public Bus Transport

46. Availability of Bus Halts and Stands for passengers to wait

- ◯ Everywhere
- ◯ Somewhere
- ◯ Few places
- ◯ Very few places
- ◯ Not available

47. Cleanness of Bus halts/stands

Mark only one oval

- ◯ Clean
- ◯ Not Clean

48. Distance between two nearby bus stops

Mark only one oval

- ◯ Short
- ◯ Long

49. Availability of buses when needed

Mark only one oval

- ◯ Available
- ◯ Not Available

50. Keeping doors closed on moving buses with passengers on board

Mark only one oval

- ◯ Yes
- ◯ No

51. Number of passengers in buses

- ◯ Overcrowded
- ◯ Not overcrowded

52. Level of crimes on the bus stands and inside buses

- ◯ Low
- ◯ Medium
- ◯ High

53. Imposing Laws relevant to public transport against offenders by the Police

- ◯ High
- ◯ Medium
- ◯ Low

54. Availability of passenger complaint handling process

- ⬭ Yes
- ⬭ No

55. Bus fare relative to the quality of bus service

- ⬭ Expensive
- ⬭ Right Fare
- ⬭ Economical

56. Frequency of experiencing harassment by co-passengers

Mark only one oval

- ⬭ Most of the times
- ⬭ Sometimes
- ⬭ Few times

57. Convenience of the bus halts/stands

Mark only one oval

- ⬭ Very convenient
- ⬭ Convenient
- ⬭ Not Convenient

Satisfaction on the Public Bus Transport Service

58. Your level of satisfaction on the physical characteristics of buses

- ☐ Very Satisfied
- ☐ Satisfied
- ☐ Dissatisfied
- ☐ Very dissatisfied

59. Your level of satisfaction on the characteristics of conductors

- ☐ Very Satisfied
- ☐ Satisfied
- ☐ Dissatisfied
- ☐ Very dissatisfied

60. Your level of satisfaction on the characteristics of drivers

- ☐ Very Satisfied
- ☐ Satisfied
- ☐ Dissatisfied
- ☐ Very dissatisfied

61. Your level of satisfaction on the actions of the Government on the public transport system

- ☐ Very Satisfied
- ☐ Satisfied
- ☐ Dissatisfied
- ☐ Very dissatisfied

Overall Satisfaction on the Public Transport System

62. Your level of satisfaction on the public transport system as a whole

- ☐ Very Satisfied
- ☐ Satisfied
- ☐ Dissatisfied
- ☐ Very dissatisfied

63. Comments

_____
_____
_____
_____
_____
_____

Appendix 2: Correlation Matrix

As the correlation matrix is large, it is provided separately in the CD