Passengers' Perceptions regarding Bus Service Quality in Context of Dhaka City

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CANDIDATE'S DECLARATION

This is hereby declared that this thesis or any part of it has not been submitted elsewhere and any degree.

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DEDICATION

This thesis dedicated to our honorable thesis supervisor SouravBorua. His continuous inspirations made this effort possible.

Table of Content

Chapter-1

INTRODUCTION

Chapter-2

LITERATURE REVIEW

Chapter-3

METHODOLGOY

Chapter-4

DATA COLLECTION

Chapter-5

DATA ANALYSIS

Chapter-6

CONCLUSION AND RECOMMENDATON

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Abstract

Bus is the major mode of public transport in Dhaka city. Despite a high modal share, bus servicequality is poor and para-transit services (taxi, CNG) are remarked as a problem in metropolitantransport systems rather than a solution. The study investigates passengers' perception regardingbus service quality at different areas of Dhaka city and presents comparative study. The researchidentifies and valuation of eight important attributes using logit model and compares dataobtained from residential and commercial area. Attributes are—Fare Expenditure, Seat Comfort,On board security, Bus frequency, Bus staff Behavior, Interior Cleanness, Route Information andPhysical condition. A question on overall quality of bus service is included in the questionnairesurvey form for cross validation of the proposed legit model. Besides, general information iscollected for evaluating homogeneity of data size, which included— Age, gender, Occupation,Monthly income. A pilot survey is performed to test the questionnaire using a smaller samplecompared to the planned sample size to check the correctness of the questionnaire. Questionnaire

survey is conducted to collect data from 300 respondents. Legit model is a classifier to describerelationship among dependent variables with independent attributes or features. SPSS v. 24.0 isused to develop legit model for the modeling

of passengers' perception regarding bus servicequality. Two models are developed where Model 1 is full model with all eight attributes andModel 2 consists with four attributes, those are-- Fare Expenditure, Interior Cleanness, RouteInformation and Physical condition. Model 1 and Model 2 predicts with 72.3% and 69.7%accuracy. Model 1 and Model 2 have 46% and 41.4% variability of survey data respectively.Model 1 indicates that the order of influence of attributes relate to overall condition are interiorcleanness, structural condition, fare expenditure and route information. Model 2 displays that theorder of influence of attributes relate to overall condition are interior cleanness, fare expenditure,Structural condition, and route information. Overall condition scored 2.97 which is slightly below average.

Chapter-1
INTRODUCTION

1.1. Background of the Study

Public transport shares the colossal part of transport of any urban city of the world. This ismighty true for a developing country like Bangladesh where 25.10% of the national populationlives in the capital city Dhaka in search of a satisfactory employment (NurunNabi, 2011).According to a statistics in 2008, urban population annual growth rate is 3.37, a high rate indeed.From 1975 to 2007, Dhaka was regarded as the second fastest growing mega city with an urbangrowth rate of 5.65% (NurunNabi, 2011). The rate of population movement is much higher forthe country than national population growth rate. In such situation the public transport system ofthe city is to be sufficient and at desired quality in order to meet the transporters" demands.The development of transport systems in Bangladesh have been mostly driven by improvisedconsiderations. The development considerations for meeting future requirements were notconsidered ideally. The transport system needs to be implemented in a competitive andsustainable basis. Failure in doing so has resulted in numerous transport problems. It has resultedin deterioration in service levels, comfort, safety, operational deficiencies and finally loss to theoperators. Due to its comparative advantages in terms of cost efficiency, flexibility andaccessibility due to initial infrastructure, road transport has emerged as the most popular mode ofpublic transport. But even for its popularity adequate investments in a sustainable way has notbeen ensured. Now, the city needs a well-articulated transport policy for the development of thesector. The private sector can also play a vital role in such developments. The level of transporttransport. Among these public transport modes buses and mini-buses are used at a higheroccupancy rate than the others. Due to bad condition of these buses, no time scheduling, poorride quality and unsafe operations many considers this particular mode of transport a poorlyorganized one. Various researches (Rahman, 2010; Karim and Mannan 2008, Hoque and Hossain2008, Haque, 2000) also claimed that the present bus services are inefficient, unproductive,

andunsafe due to long waiting time, delay on plying, long boarding time, overloading, discomfort,long walking distance from the residence/work place to bus stoppages, and various similarcauses. Most of the people using the services are compelled to use this service due to one majorpositive point, and that is, low service fare compared to existing other transport alternatives(CNG auto-rickshaws, rickshaws, taxies etc.).The public transport service in Dhaka can be characterized by weak and uncompetitive publicand private institutions and low level investments. The service is operated with high level ofrisks, poor socio-political effects and man-made disruptions. The quality of services for urbanbus transport as well as other transport has been very objectionable. The overcrowded buses,frequent breakdowns, extreme unreliable service, poor safety and security records are commonlyknown to urban bus service users.Overloaded vehicles, outdated buses driving on roads, hazardous driving, boarding and alightingoperations, road accidents are some of the most common phenomena in public transport sectors,particularly in urban areas of the country. These phenomena have developed due to lack of lawenforcements by the implementing agencies and also for corruption within themselves. If thetraffic rules and regulations and related other rules could be applied strictly, the minimum servicequality standards could be ensured to the service users.Urban transport that is urban bus transport is very crucial for the growth of national economy. If

1.2. Problem Statement

The urban public transport of megacity Dhaka, which is the main means of movement of low andmiddle income people, has been delivering shabby and unsatisfactory services to its users. Thepoor service delivery of the bus public transport is partly responsible for weak and outdatedInstitutional structures and regulatory bodies that patronize the urban bus services. Lack ofCapacity and shortage of resources are largely hampering their way to good governance. Theproblem can also be attributed to lack of realization of the role of private sectors in solving theproblem.The first thing to be done is to assess the extent of the service deficiency through an easy means.This can be done through determining the quality of public bus service experienced by thepassengers. This would help to determine the most intense parameters that cause most sufferingsto the passengers. Once the factors responsible for unsatisfactory performance have beenDetermined, the ways for improvements can be sought. This would also pave ways to friendlypolicy

making and suitable infrastructures for urban transport development. Thus, consideringthe role of public bus transport in accelerating the economic and social growth and also to makeit an appealing means for daily movement determination of their quality of service is an urgentneed.

1.3. Objectives of the Study

objectives of this study are as shown below: Determination of service quality from passengers" perspective for public bus transport Comparison between local buses and air-condition buses for various service quality aspectsDetermining the critical factors that are desired most by passengers for service improvement.

1.4. Scope of the Study

The study provides several scopes. Some of the scopes have been pointed out below: The main objective of this study is to determine the service quality of existing public bustransport. The first thing that it does is that it provides a somewhat framework fordetermining service quality that would undergo more revisions in the future.In the process of determining the service quality, it points out the factors responsible for theexisting unsatisfactory service.The determination of service quality from passengers viewpoint paves ways forimprovements of the current service that would meet the needs of a lot of commuters. In the process of determination, the weaknesses present in current administration andGoverning bodies could be put forth and ways for their strengthening can be considered.Determining service quality would make passengers aware of the significance of theirResponses and would likely make them more fascinating about using the service.The study can also through lights for undertaking service quality study for similar types ofServices.

1.5. Organization of the Thesis

The thesis has been organized in six chapters. A brief outline of the chapters has been presentedbelow:

Chapter one, introduction: this chapter provides information to the reader about the backgroundand context of the study. Besides, this chapter also let the reader know about the purpose of thestudy. Reader

learns about are the scopes of the study.Chapter two, literature review: this chapter presents the previous literatures related to the studytopic. Various ways by which the study has been performed in other countries, includingBangladesh and what were their considerations are also presented in brief. This chapter alsoprovides specific details that are related to the study.Chapter three, methodology: This chapter gives details of the method that has been selected forthe performance of the study. Also, provides justification for the selection of the method amongthe alternatives. The chapter tries to detail the procedure so that one can perform the study usingthe method described in this chapter.Chapter four, data collection: Data collection has been presented in a detailed way in this chapter.The study area and sites, types of data used, data collection tools etc have been described in briefin this chapter. This chapter also states the limitations of the data collection.Chapter five, data analysis: Various types of data analysis have been presented in detail in thischapter. Comparison between data has been made. Field observations related to the acquired datahave also been presented in this chapter.Chapter six, conclusion and recommendation: This chapter presents the concluding remarks andRecommendations of the study**.**

1.6. Conclusion

Public bus transport is considered very significant for present Dhaka city layout. The road waytransport mode is much more developed within the city than any other modes. To improve theexisting service condition of the bus transport evaluation of the present condition is aprerequisite. This determination also widen up scopes for other aspects of the study. If the publictransport system within the city can be taken to a satisfactory level as desired by its users thenmajor transport problems of the Dhaka city could be solved**.**

Chapter-2

Literature Review

2.1. General

Transportation involves public interference. And public interference is represented by expressions of satisfaction or dissatisfaction over the service perceived. The service provided by a bus service provider can be evaluated from the service users" feedback about that service.There should be ways to measure the service users" perceptions of services. This chapter of the thesis deals with presenting and analyzing various ways to evaluate service quality perceived by its service users that has been used by various organizations.

2.2. Service Quality

The key element that distinguishes a service from rest of the category of the same is quality. The quality here refers to quality of the service or service quality. Service quality is often defined as satisfaction level of expectations. Grönroos (2001: 151) expressed that customer satisfaction and happiness are more strongly affected by their expectations. The term „expectations", as used by behavioral researchers, is not as precise as the usage by mathematicians, which is "what is likely to happen, on average" (Metters, King-Metters, Pullman, and Walton. 2006: 69). In the view of behavioral researchers, the term „expectation" refers to „an expectant mental attitude" (Dictionary.com). In simple word it means what a mind expects from a superior service. Again, service quality was defined by Parasuraman et al. (1988) and Gronroos (1984) as a comparison between customer expectation and perception of service. Service quality in general consists of five distinct dimensions. They are tangibles (physical facilities, equipments, and appearance of personnel), reliability (ability of performing the promised service

asdesired),responsiveness (willingness to help customers in a prompt manner), assurance (knowledge and their ability to inspire trust and confidence), and empathy (caring and individualized attention).

2.3. Customer Satisfaction and Service Quality

There exists a definite link between service quality and customer satisfaction. But it is difficult to define the relationship accurately. This is because, various issues that is responsible for improving service quality may not be directly linked or directly perceived by the customers. Thus the relationship is seen as a complex one. Often Customer satisfaction is seen as a part of service quality aspects. Nevertheless for developing country like ours, where data regarding service quality of operators‟ perspective is not available easily, a wise decision and a cheap way to get a taste of service quality would be to determine the service quality from the road users‟ or customers‟ perspective. According to Oliver (1997), satisfaction is defined as the customer's fulfillment. It is a judgment that a product or service feature, or the product or service itself, provided (or is providing) a pleasurable level of consumption-related fulfillment, including levels of under- or over fulfillment. Need fulfillment is a comparative processes giving rise to the satisfaction responses. Any gaps lead to disconfirmation; i.e., Positive disconfirmations increases or maintain satisfaction and negative disconfirmation create dissatisfaction. Quality is the total outcome of a service rendering provision for which satisfaction is achieved in an overall fashion. In short term, service features determine quality which then satisfies consumer needs.

2.4. Customer Expectations of Service

Customer expectations of service refer to what a customer expects from a service. According to Zeithaml*et al*. (2006: 81) "customer expectations are beliefs about service delivery that serve as standards or reference points against which performance is judged". Customer expectations are critical to service providers as their attitude would be in accordance with their expectations. When customer attitudes towards a service would become poor customers or passengers in public transport will search for new alternatives. This will ultimately affect the service provides goal. In order to have passengers positive

attitudes towards service and thus to achieve the service providers goals it is necessary to evaluate what passengers want and what the service providers are providing.

2.4.1. Levels of Service Expectations

Passengers have different types of service needs. They vary in magnitude. Generally researchers are concerned with two types of customer expectations. One is according to the level of service expectations, in which the „highest level" is called the desired level.As the name suggests, it reflects thedesired service facilities by the customers. The other is also related to level of service, is called „adequate service". The „adequate service" represents the „minimum tolerable expectation". It is the bottom level of service that is acceptable to the customer (Metters*et al*., 2006: 83).

2.4.2. The Zone of Tolerance

The space that is left between the highest level and the adequate level is the zone of tolerance. The service provided by the same provider tends to vary with specific situations and needs. It has been seen that desired level is more stable than the adequate level. Also, the zone of tolerance focuses on the adequate service level rather than the desired service level. The zone of tolerance not only concerned with the service level but also with the service delivery process. An individual"s zone of tolerance varies with various factors, including those that are company controlled. The more the factor is important to the customer less is the zone of tolerance (Zeithaml*et al*., 2006: 87).

2.4.3. Factors that Influence Customer Expectation

Numerous factors influence customer expectations. In general, these factors are grouped into three parts in terms of the levels of the service expectations. They are the desired service expectations, adequate service expectations and both desired and predicted service expectations.

2.4.4 What is SPSS?

.SPSS is short for Statistical Package for the Social Sciences, and it's used by various kinds of researchers for complex statistical data analysis.

The SPSS software package was created for the management and statistical analysis of social science data. It was was originally launched in 1968 by SPSS Inc., and was later acquired by IBM in 2009. Officially dubbed IBM SPSS Statistics, most users still refer to it as SPSS. As the world standard for social science data analysis, SPSS is widely coveted due it's straightforward and English-like command language and impressively thorough user manual.

SPSS interface
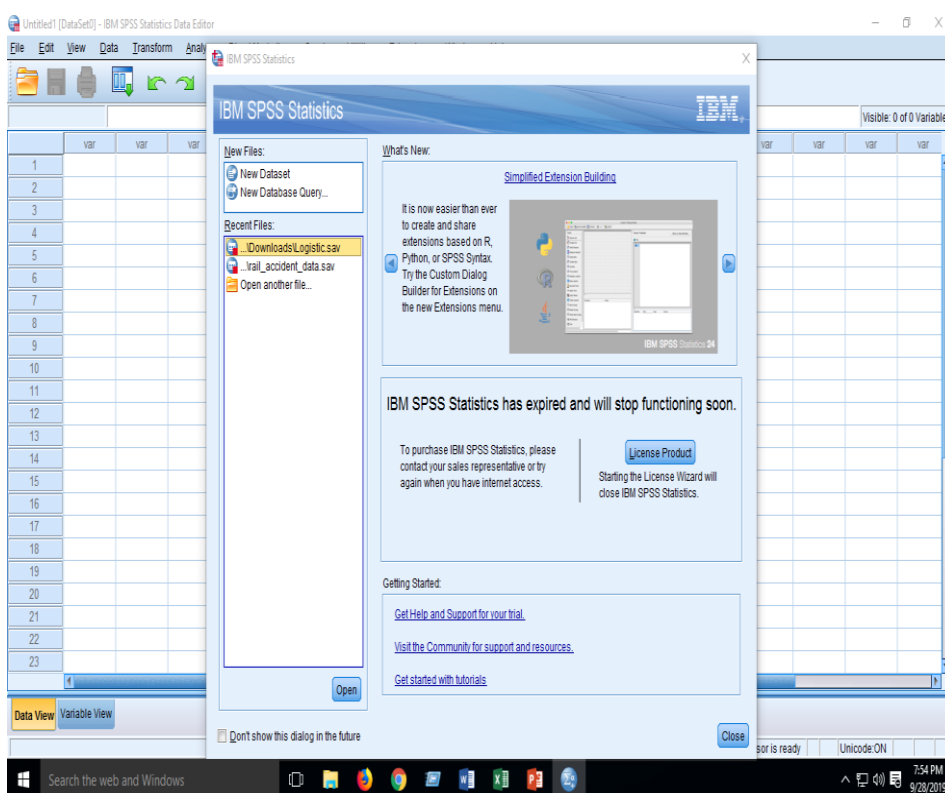
2.4.5 The Benefits of Using SPSS for Survey Data Analysis

Thanks to its emphasis on analyzing statistical data, SPSS is an extremely powerful tool for manipulating and deciphering survey data. Fun fact: The data from any survey collected via Survey Gizmo can be exported to SPSS for detailed analysis.Exporting survey data to SPSS's proprietary .SAV format makes the process of pulling, manipulating, and analyzing data clean and easy.By doing so, SPSS will automatically set up and import designated variable names, variable types, titles, and value labels, meaning that minimal legwork is required from researchers.Once survey data is exported to SPSS, the opportunities for statistical analysis are practically endless. In short, remember to use SPSS when you

need a flexible, customizable way to get super granular on even the most complex data sets. This gives you, the researcher, more time to do what you do best and identify trends, develop predictive models, and draw informed conclusions.

2.4.6 Multinomial Logistic Model (MNL)

Multinomial Logistic Regression is the regression analysis to conduct when the dependent variable is nominal with more than two levels. Similar to multiple linear regressions, the multinomial regression is a predictive analysis. Multinomial regression is used to explain the relationship between one nominal dependent variable and one or more independent variables. Multinomial logistic regression (often just called 'multinomial regression') is used to predict a nominal dependent variable given one or more independent variables. It is sometimes considered an extension of binomial logistic regression to allow for a dependent variable with more than two categories. As with other types of regression, multinomial logistic regression can have nominal and/or continuous independent variables and can have interactions between independent variables to predict the dependent variable.

2.4.7 Summary

Service quality is satisfaction level of expectations. This chapter in the beginning defined service quality and tried to find relation between service quality and satisfaction. The role of service quality for attracting and retaining ridership is also a significant topic. The chapter presented various factors and dimensions related to service quality by various organizations such as TCRP, European Standards of public transport, SERVQUAL etc. A brief description about public transport in Bangladesh and sufferings of women in buses has also been presented in this chapter.

Chapter-3

Methodology

3.1. Introduction

This chapter of the thesis deals with the method that has been applied in preceding with the thesis objectives. The chapter discusses the questions that were raised during performance of the study. The chapter also provides an overview of the research approach and explanation of specific terms that were used reaching the study goals.In determining the passenger perceived service quality of existing public transport in Dhaka city a proper method of attack needs to be selected. An appropriate way of proceeding to the study leads to success in a steady way while an approach without good guidance leads to wondering around. This chapter takes an attempt to show how the thesis work was proceeding and the reason behind following those ways

3.2. Research Design

The research identifies and valuation of eight important attributes using logit model and compares data obtained from residential and commercial area.

Attributes are–

➢ Fare Expenditure,

➢ Seat Comfort,

➢ On board security,

➢ Bus frequency,

➢ Bus staff Behavior,

➢ Interior Cleanness

➢ Route Information

➢ Physical condition.

A question on overall quality of bus service is included in the questionnaire survey form for cross validation of the proposed logit model.All eight attributes and overall rating are converted to numerical

dummy variables using Likert scale (1-5)A question on overall quality of bus service is included in the questionnaire survey form for cross validation of the proposed logit model. General information is collected for evaluating homogeneity of data size,

which included–

➤ Age,

➤ gender,

➤ Occupation,

➤ Monthly income

3.3. Evaluation of the Questionnaire

After preliminary design, the questionnaire was examined from the other sides. Consideration was given so that all encompassing questionnaire do not have an extra length. Whether all questions were necessary was a valid question. Questions that divert the attraction of the respondents were tried to avoid.

3.4. Questionnaire Pretesting

After a preliminary design of questionnaire it is necessary to test the usefulness of the questionnaire. For this purpose pre- testing is performed. Pretesting involves taking surveys to a limited number of potential respondents. The selection procedure may be based on convenience sampling but it is to ensure that the selected respondents are not too divergent from the target population. A statistical sample for pre-testing is not required. The pretesting reveals the scope for improvements to the questionnaire. The pre-testing process allows a researcher to see whether the respondents have any difficulty in understanding any questions in the questionnaire. The researcher needs to understand which questions are proofing difficult to the respondents to answer. Ambiguous questions are to be made clear. Pretesting helps to understand whether, the researcher can find meaningful outcome from the answers. It is wise to tabulate the results of the pre-test and to perform a pre analysis to ensure that desired research goal are likely to be achieved.

The questionnaire designed for the study included closed format questions. The closed format included liker questions, dichotomous questions and rating questions. The liker questions provided options from

Strongly Agree to Strongly Disagree. The rating questions included options from Very Good to Very Poor to differentiate even slight variations. Many questions were used to get the maximum out of the respondents. The questionnaire also included demographic questions to relate demographic features with the responses. The questionnaire was originally designed in English. Later it was translated to Bengali with intense effort to express the same meanings as the English version. The pretesting of questionnaire often plays a significant role in deciding the appropriateness of the questions and their styles.

3.5. Reaching the Respondents

Designed questionnaire are required to reach the desired population. There are various methods available to do the job. Self-stamp envelopes, distributing forms to boarding passengers, by mail, by telephone etc. options are available to use. But in this survey the respondents were reached personally by the surveyor. This is because it gives chance for clarifying some questions that may arrive unclear to the respondents and also surveyor can feel the respondent about selecting an option.

3.6. Summary

This chapter gives .Pretesting Research Design Evaluation of the Questionnaire .Questionnaire. Each intersection has been briefly described along with geometric configuration. This method is much more superior to manual data collection. Methodology of measurement of saturation flow and delay in the field is discussed in detail. Next chapter has deals with data collection .

Chapter-4

Data Collection

4.1.Introduction

This chapter of the thesis deals with the data collection part of the study. Data collection is a very significant step for any research study. Data collection is a dutiful task demanding planning, effort and patience and perseverance. Study area, data sites, type of data required, data collection ways, and various other things are presented in this chapter.

4.2. Study Area

Since the study is related to acquiring information from public bus service users of a particular route, the study area is centered to that route. The particular route is Dhanmondi to MirpurandDhanmondi to Motijhil The study area is located along the route including the bus stops along the route.

4.3. Data Collection Sites

Data collection sites are places from where data were primarily collected. For this particular study data was collected mainly from these spots are: Motijheel bus stop, Dhanmondi 27 bus stop, Mirpur Technical bus stop.

Figure 4.1: Inside View of bus service

Figure: 4.2 : Outside view of bus service

Figure :4.3 : Mirpur bus stop

4.4 Data Sheet

Service Quality Assessment of Public Bus Service

 # Age   **# Occupation : Student**
/House Wife/

                                   Service

Holder/Businessman

#Gender   **#Income Monthly**

<u>Attribute</u>

1. **Very Poor**   **1**
2. **Poor**   **2**
3. **Average**   **3**
4. **Good**   **4**
5. **Very Good**   **5**

	Very Poor	Poor	Average	Good	Very Good
1.Fare Expenditure					
2. Seat comfort					
3. On Board Security					
4. Bus frequency					
5.Bus Staff Behavior					
6.Interior cleaners					
7.Route information					
8.Structural condition					
9.Overall					

4.5. Data Collection Sheet

Figure 4.4 Data collection sheet of a service holder

Gender F   # Income: Monthly

Attribute

1.Very poor	1
2.Poor	2
3.Average	3
4.Good	4
5. Very good	5

	Very Poor	Poor	Average	Good	Very Good
1. Fare Expenditure			✓		
2.Seat comfort			✓		
3.On board security		✓			
4.BUS Frequency		✓			
5.Bus staff Behavior		✓			
6.Interior cleaners			✓		
7.Route Information		✓			
8.Structural Condition			✓		
9.Overall			✓		

Figure 4.5 Data collection sheet of a house wife

Gender M   # Income: Monthly

Attribute

1.Very poor	1
2.Poor	2
3.Average	3
4.Good	4
5. Very good	5

	Very Poor	Poor	Average	Good	Very Good
1. Fare Expenditure			✓		
2.Seat comfort			✓		
3.On board security		✓			
4.BUS Frequency			✓		
5.Bus staff Behavior		✓			
6.Interior cleaners				✓	
7.Route Information		✓			
8.Structural Condition				✓	
9.Overall				✓	

Figure 4.6 Data collection sheet of a student

Figure 4.7 Data collection sheet of a businessman

4.6. Summery

A well accepted study requires ample authentic information on which the study is based on. Because, the study tries to put forward or prove a point of research. If the information is not wholly reliable then the research becomes weak in its stance. Also there should be ample information on which a decision can be made. For this study primary source of information was obtained from the questionnaire survey. Although, the survey was performed cautiously by the surveyors, professional surveyors would have been

more suitable. The questionnaire involved some qualitative questions for which it was difficult to get the expressions of the respondents. Also, in such a country where many people lack in education it was difficult to interpret their answers for a particular question. Long time use of very poor bus service led many of them to lose their real taste for desired service. This made the questionnaire survey even harder.The target population was huge for the study. It was very difficult to get the sampling in the right way. Also, for such a huge population the sample size is big. Due to resource and time shortage it was quite difficult to get the desired amount of sample. Most of the data were collected at bus stop locations. Respondents were in a hurry state. There was possibility that some of the respondents may answer some questions superficially.

Chapter-5

Data Analysis

5.1. Introduction

The chapter of the thesis deals with the analysis of collected data. As mentioned earlier, primary data were collected for this study on evaluation of service quality in passengers" perspective. Data stored from the questionnaires and some of field observations will be analyzed in this part of the thesis.

5.2 .Explanatory variables

An explanatory variable is a type of independent variable. The two terms are often used interchangeably. But there is a subtle difference between the two. When a variable is independent, it is not affected at all by any other variables. When a variable is not independent for certain, it's an explanatory variable

Fare Expenditure

Table 5.1: Frequency of Fare Expenditure

Fare Expenditure

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	11	3.7	3.7	3.7
	2	119	39.7	39.7	43.3
	3	121	40.3	40.3	83.7
	4	47	15.7	15.7	99.3
	5	2	.7	.7	100.0
	Total	300	100.0	100.0	

The Figure 5.1 below shows the histogram of Fare expenditure.

FareExpenditure

Mean =2.70
Std. Dev. =0.799
N =300
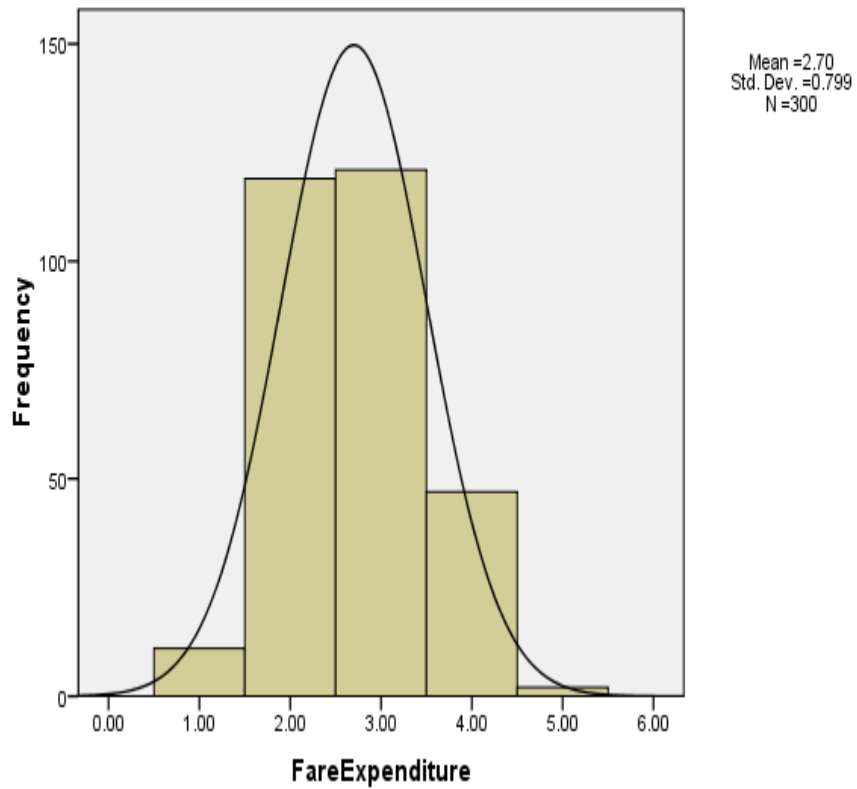
Seat Comfort

	Frequency	Percent	Valid Percent	Cumulative Percent
1	21	7.0	7.0	7.0
2	84	28.0	28.0	35.0
3	127	42.3	42.3	77.3
4	65	21.7	21.7	99.0
5	3	1.0	1.0	100.0
Total	300	100.0	100.0	

Table5.2: Frequency of Seat Comfort
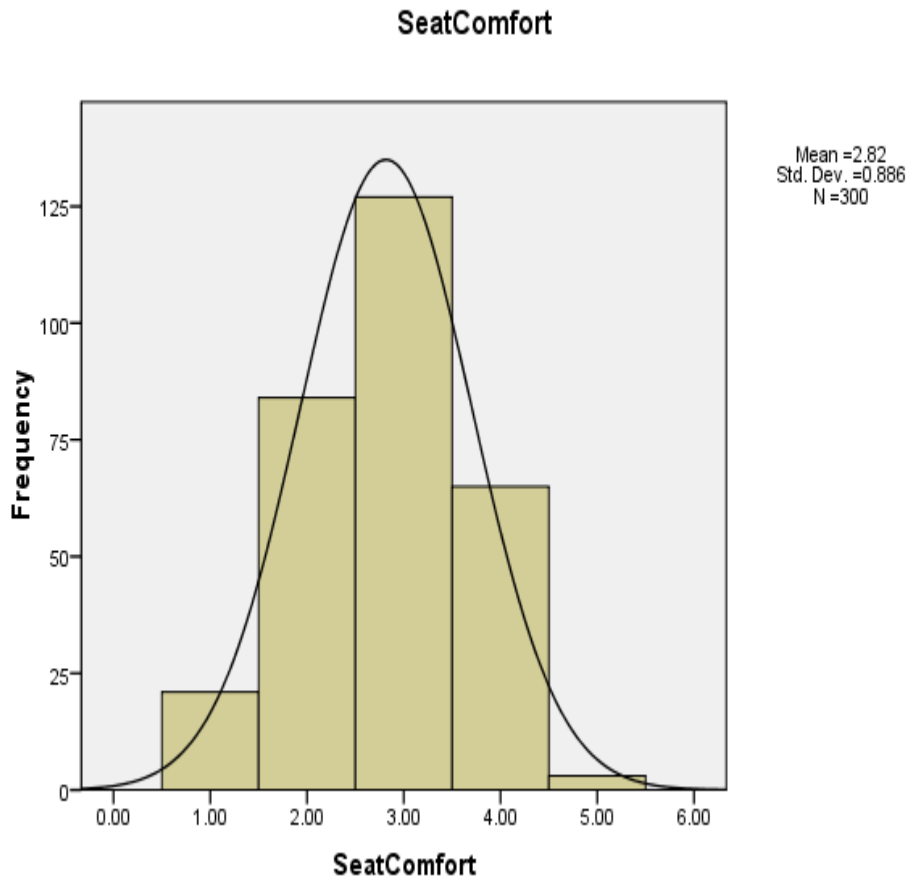
Figure 5.2: Histogram of Seat Comfort

On Board Security

Table 5.3: Frequency of On board security

OnBoardSecurity

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	25	8.3	8.3	8.3
	2	105	35.0	35.0	43.3
	3	100	33.3	33.3	76.7
	4	64	21.3	21.3	98.0
	5	6	2.0	2.0	100.0
	Total	300	100.0	100.0	
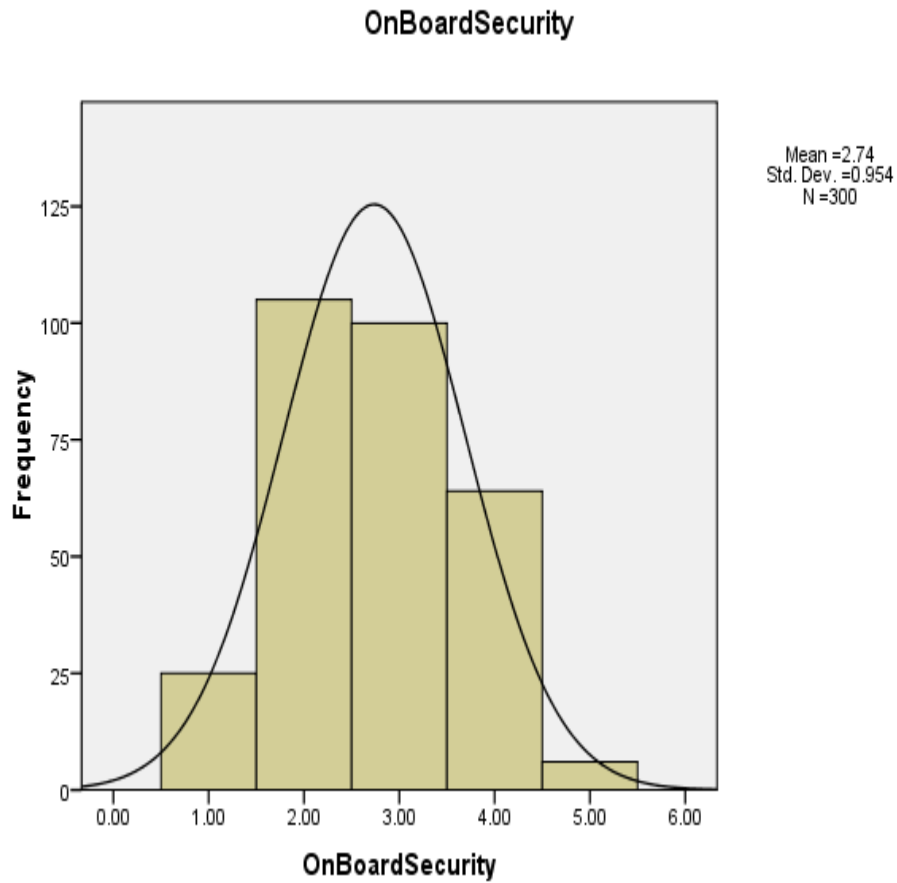
Figure 5.3: Histogram of On board security

Bus Frequency

Table 5.4: Service quality Frequency of Bus frequency

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	16	5.3	5.3	5.3
	2	67	22.3	22.3	27.7
	3	131	43.7	43.7	71.3
	4	75	25.0	25.0	96.3
	5	11	3.7	3.7	100.0

Bus Frequency

Table 5.4: Service quality Frequency of Bus frequency

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	16	5.3	5.3	5.3
	2	67	22.3	22.3	27.7
	3	131	43.7	43.7	71.3
	4	75	25.0	25.0	96.3
	5	11	3.7	3.7	100.0
	Total	300	100.0	100.0	
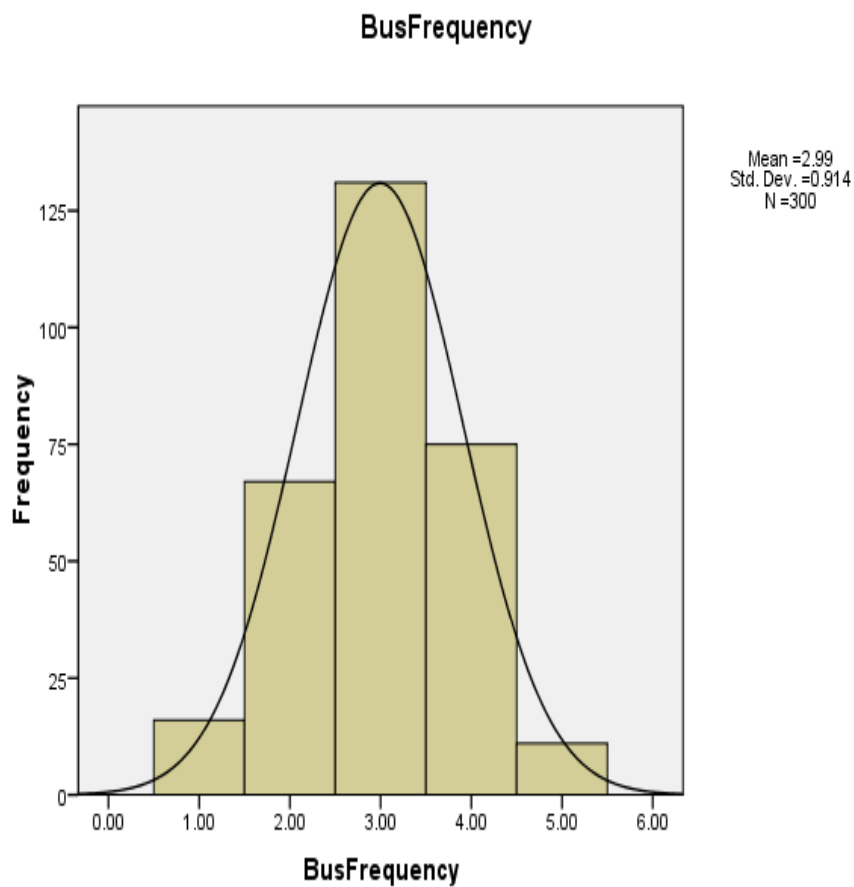
Figure 5.4: Histogram of Bus frequency

Bus Staff Behavior

Table 5.5: Frequency of Bus staff behavior

BusStaffBehavior

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	30	10.0	10.0	10.0
	2	98	32.7	32.7	42.7
	3	122	40.7	40.7	83.3
	4	47	15.7	15.7	99.0
	5	3	1.0	1.0	100.0
	Total	300	100.0	100.0	

BusStaffBehavior

Mean =2.65
Std. Dev. =0.896
N =300
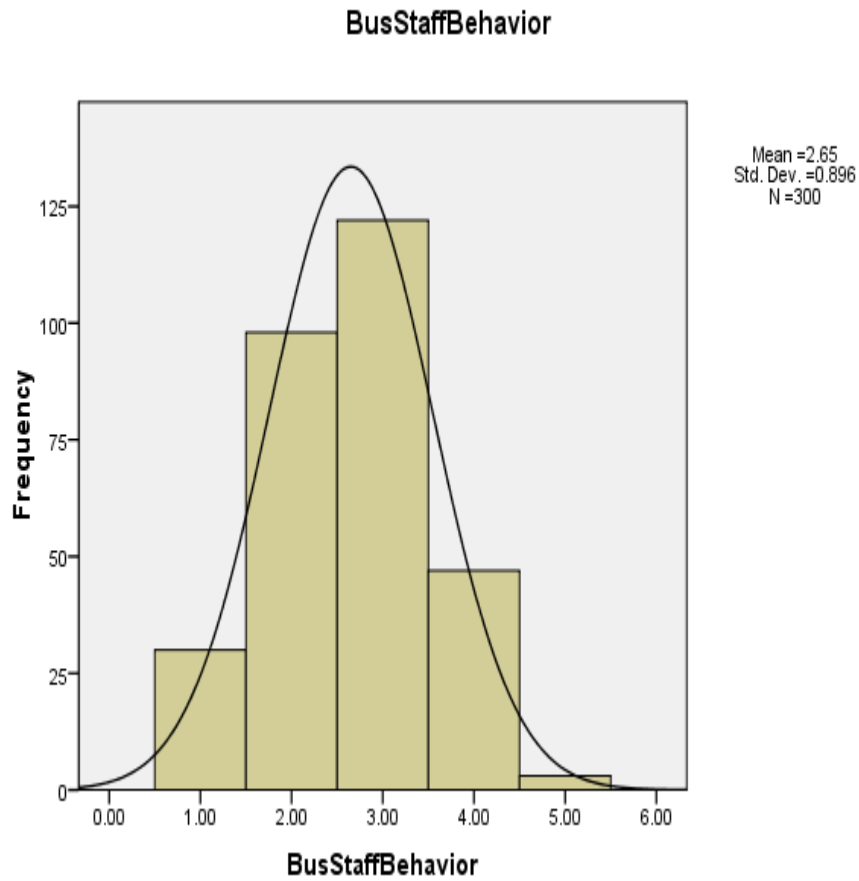
Figure5.5: Histogram of Bus Staff behavior

Interior Cleanness

Table5.6: Frequency of Interior Cleanness

InteriorCleanness

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	25	8.3	8.3	8.3
	2	87	29.0	29.0	37.3
	3	130	43.3	43.3	80.7
	4	54	18.0	18.0	98.7
	5	4	1.3	1.3	100.0
	Total	300	100.0	100.0	
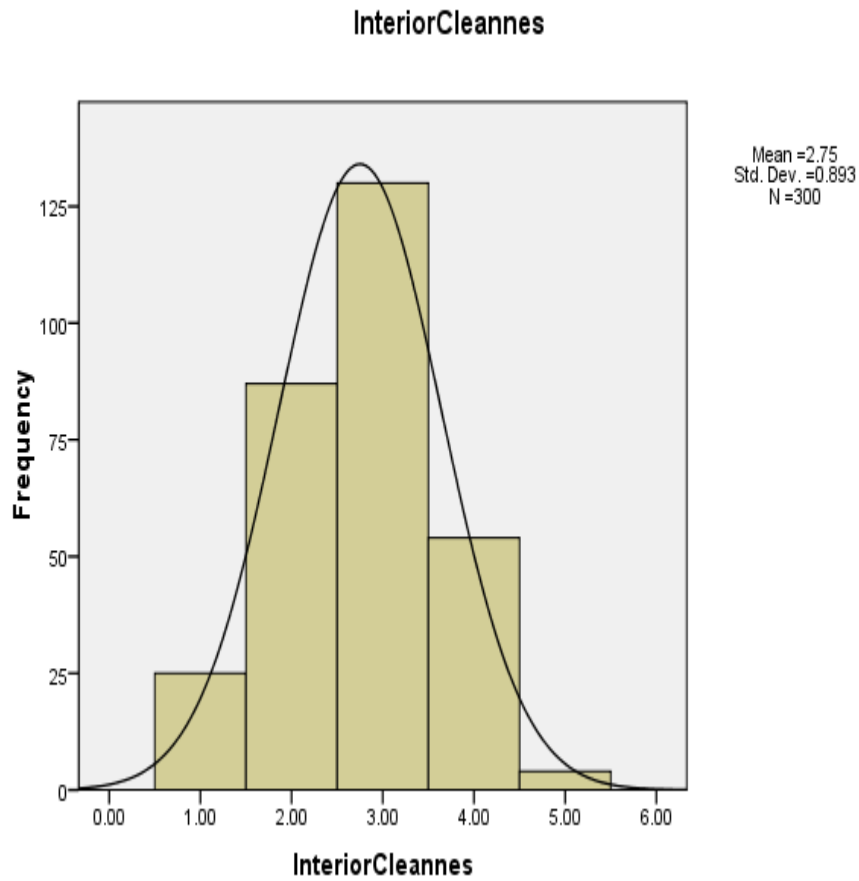
Figure 5.6: Histogram of Interior cleanness

Route Information

Table 5.7: Frequency of Route information

Route Information

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	4	1.3	1.3	1.3
	2	73	24.3	24.3	25.7
	3	149	49.7	49.7	75.3
	4	72	24.0	24.0	99.3
	5	2	.7	.7	100.0
	Total	300	100.0	100.0	
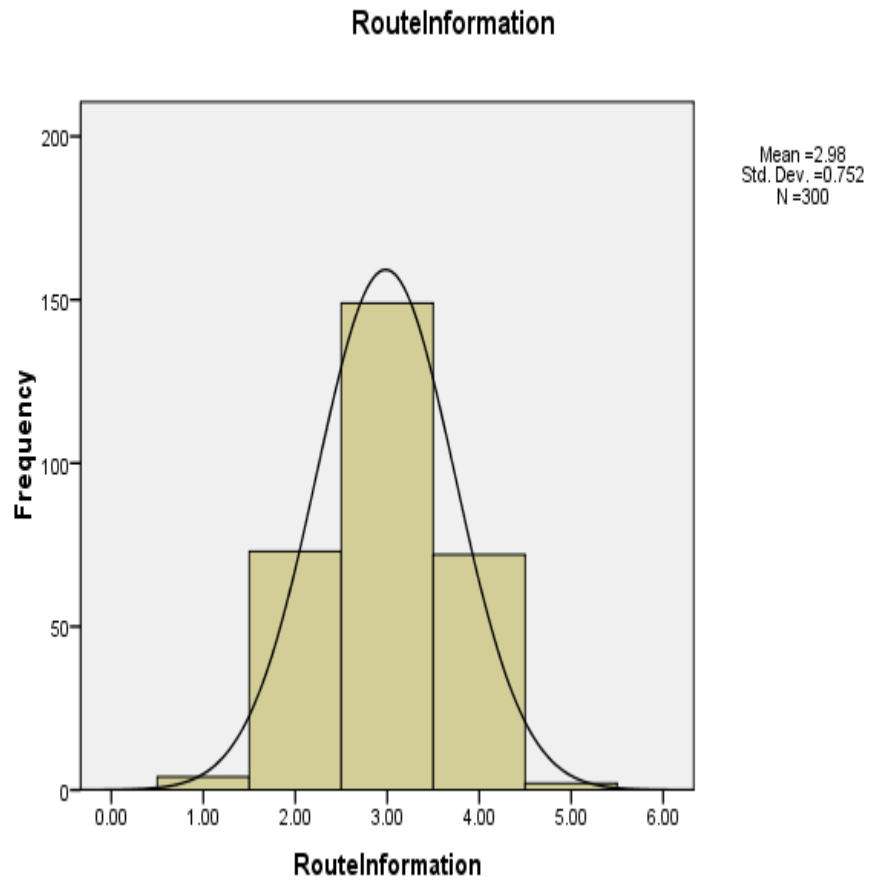
Figure 5.7: Histogram of Route information

Structural condition

Table 5.8: Frequency of Structural condition

Structural Condition

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	18	6.0	6.0	6.0
	2	86	28.7	28.7	34.7
	3	120	40.0	40.0	74.7
	4	71	23.7	23.7	98.3
	5	5	1.7	1.7	100.0
	Total	300	100.0	100.0	

StructuralCondition

Mean =2.86
Std. Dev. =0.902
N =300
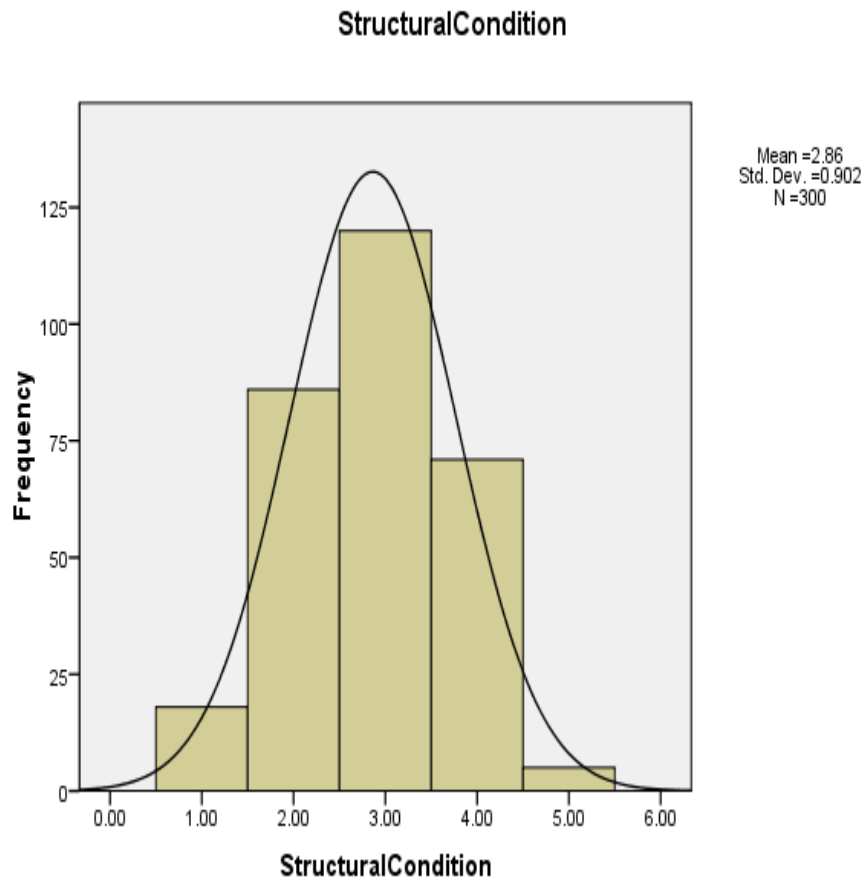
Figure 5.8: Histogram of Structural condition

Overall condition

Table 5.9: Frequency of overall condition

Overall

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	3	1.0	1.0	1.0
	2	52	17.3	17.3	18.3
	3	198	66.0	66.0	84.3
	4	46	15.3	15.3	99.7
	5	1	.3	.3	100.0
	Total	300	100.0	100.0	
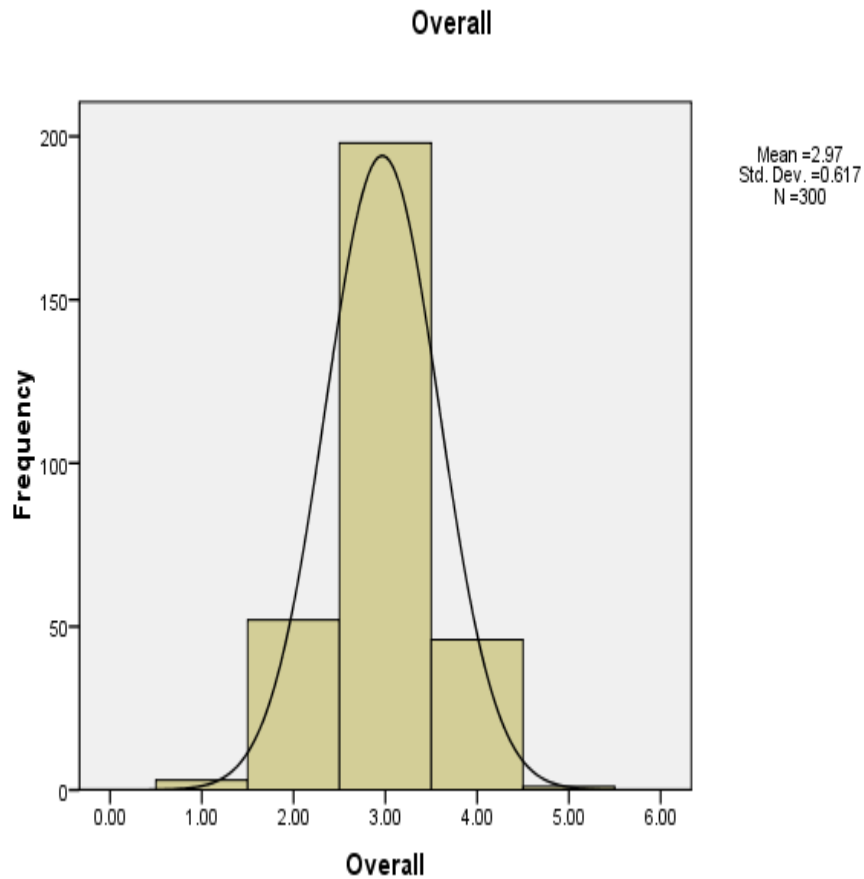
Figure 5.9: Histogram of overall condition

Over all condition of bus SQ assessed by respondents is normally distributed. The average score of overall condition is 2.97 with standard deviation 0.617

Demographic data

Age, gender, occupation and monthly income are demographic information which are collected in the questionnaire survey. Those parameters are very useful to study heterogeneity of dataset. Demographic heterogeneity of data are presented in the following portion.

Monthly income

Figure 5.10 shows monthly income of respondents. 52.45% respondents have monthly income 20k-50k BDT. Only 14.22% have monthly income above 150k BDT
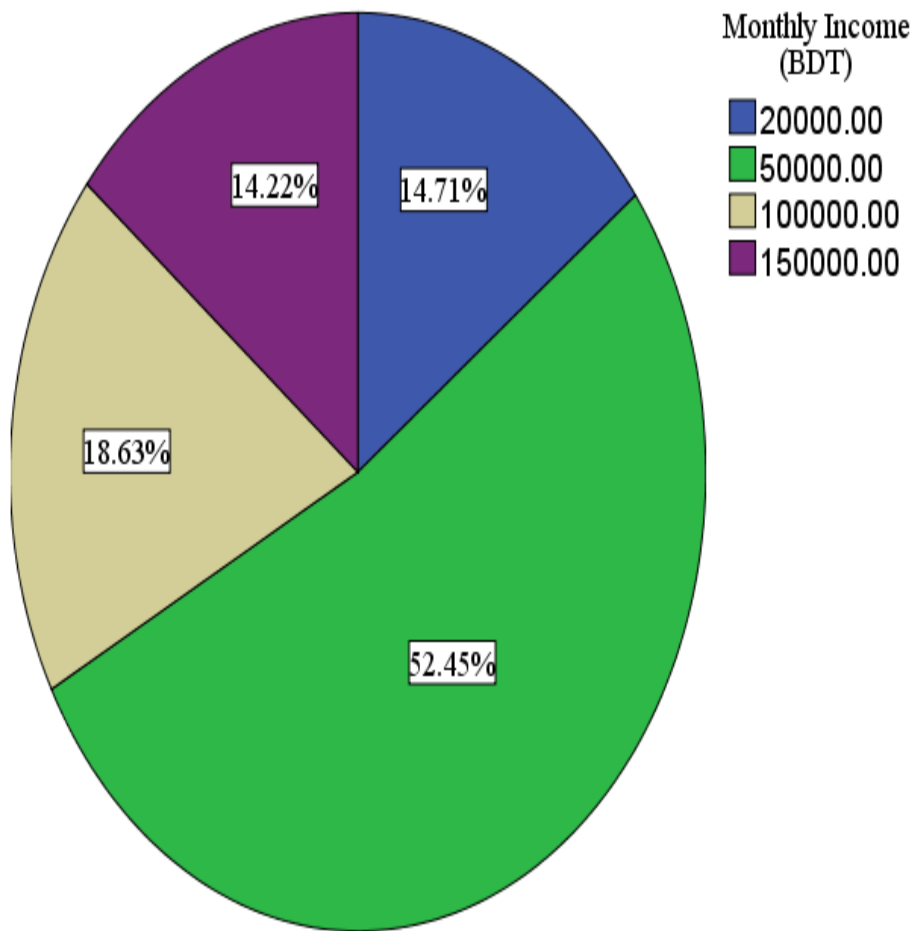
Figure 5.10: Income group of respondents

Occupation

Figure 5.11 shows occupation wise group distribution among respondents. 54.67% are service holder among total 300 respondents. 23.67% are students.
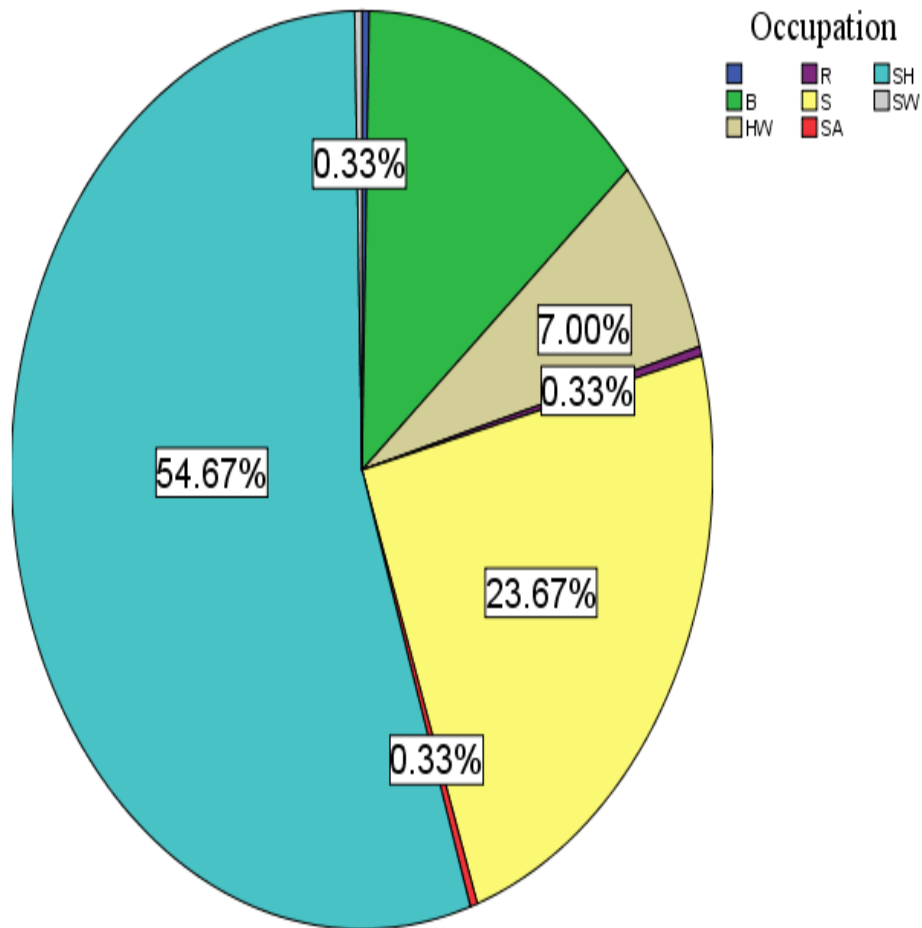
Figure 5.11: Occupation group of respondents

Age

Figure 4.12 represent the age group of respondents. 31.33% and 28.33% are below 30 year and below 40 year respectively. Below 60 year and below 20 year age are only 6% and 15.67% respectively.
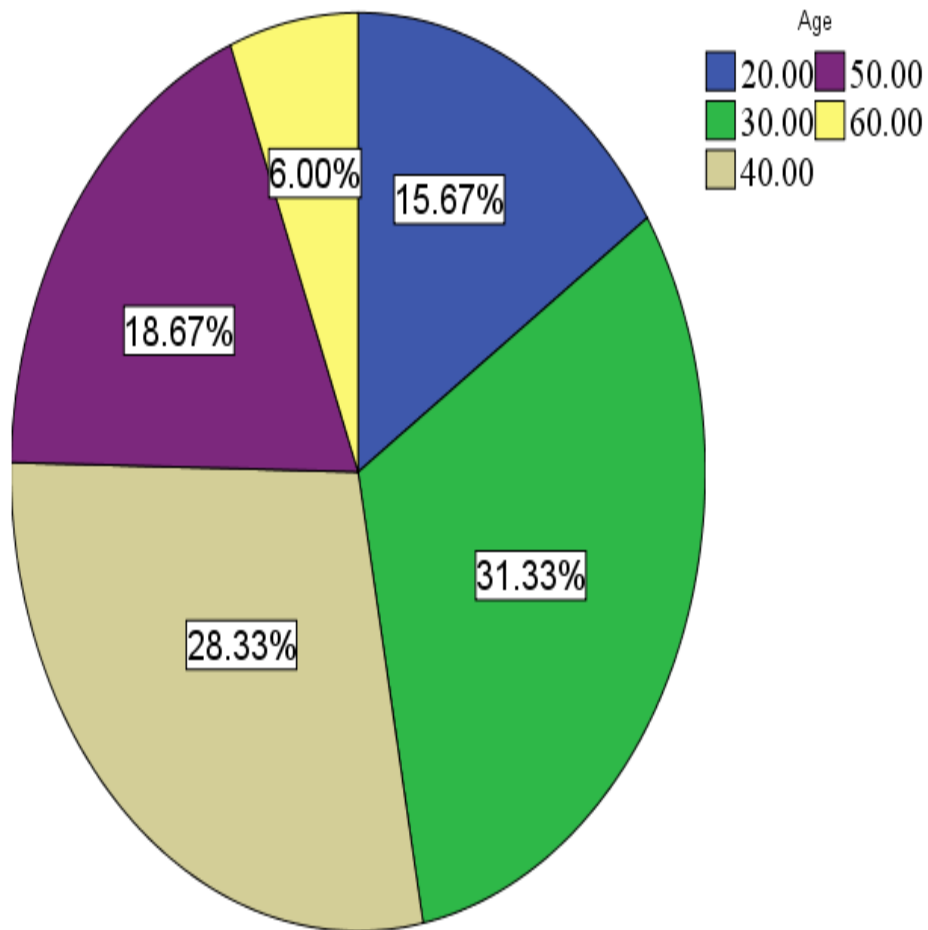
Figure 5.12: Age group of respondents

Gender

78% respondents are male and 22% respondents are female. Figure 4.13 shows pie chart of Gender distribution of respondents
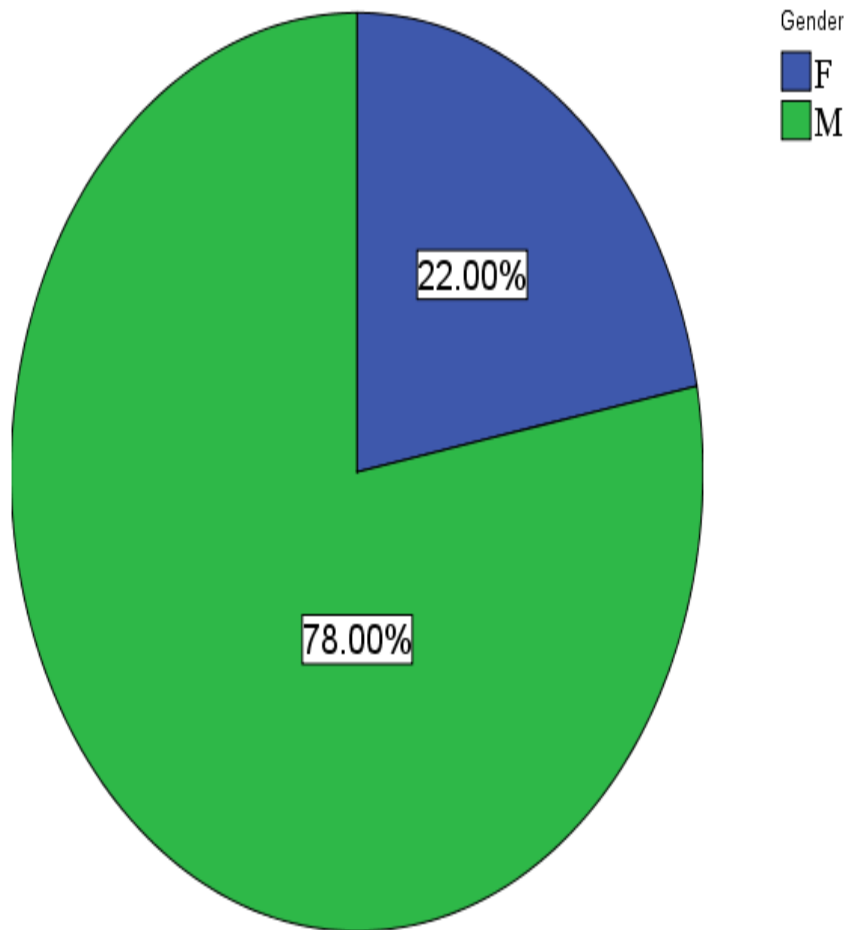
Figure 5.13: Gender group of respondents

Correlation matrix

Correlation matrix shows the relationships between variables are categorized into different correlation structures, which are distinguished by factors such as the number of parameters required to estimate them. As mentioned earlier, correlation among independent variables with dependent variable are estimated at the beginning of statistical analysis. Dependent variable of this study is Overall condition and independent variables are,Fare expenditure, seat comfort, On borad cleanness, Route information and Structural condition. Hence, there are total eight (8 nos.) independent variables which are used as attributes. Coefficent of correlation (r) ranges from -1 to +1. The more correlation between two variables the more r value close to +1. Correlation value 0 represent no relation

and -1 represent inversely related. The correlation matrix is presented in the following Table

Correlations		FareEx penditu re	SeatC omfo rt	OnBoar dSecuri ty	BusFr equen cy	BusStaf fBehavi or	Interior Cleann es	RouteIn formati on	Structura lConditi on	Ov era ll
FareExp enditure	Pear son Corr elati on	1	.271**	.357**	.377**	.329**	.316**	.159**	0.110	.27 1* *
	Sig. (2- taile d)		0.000	0.000	0.000	0.000	0.000	0.006	0.057	0.0 00
	N	300	300	300	300	300	300	300	300	30 0
SeatCom fort	Pear son Corr elati on	.271**	1	.279**	.291**	.310**	.458**	.121*	.286**	.31 3* *
	Sig. (2- taile d)	0.000		0.000	0.000	0.000	0.000	0.036	0.000	0.0 00
	N	300	300	300	300	300	300	300	300	30 0
OnBoard Security	Pear son Corr elati on	.357**	.279**	1	0.059	.279**	.347**	.115*	.374**	.25 8* *
	Sig. (2- taile d)	0.000	0.000		0.306	0.000	0.000	0.046	0.000	0.0 00
	N	300	300	300	300	300	300	300	300	30 0
BusFreq uency	Pear son Corr elati on	.377**	.291**	0.059	1	0.111	.305**	.233**	.165**	.26 7* *
	Sig. (2- taile d)	0.000	0.000	0.306		0.054	0.000	0.000	0.004	0.0 00
	N	300	300	300	300	300	300	300	300	30 0

BusStaff Behavior	Pearson Correlation	.329**	.310**	.279**	0.111	1	.250**	.230**	.143*	.281**
	Sig. (2-tailed)	0.000	0.000	0.000	0.054		0.000	0.000	0.013	0.000
	N	300	300	300	300	300	300	300	300	300
InteriorCleannes	Pearson Correlation	.316**	.458**	.347**	.305**	.250**	1	0.019	.547**	.513**
	Sig. (2-tailed)	0.000	0.000	0.000	0.000	0.000		0.747	0.000	0.000
	N	300	300	300	300	300	300	300	300	300
RouteInformation	Pearson Correlation	.159**	.121*	.115*	.233**	.230**	0.019	1	0.016	.201**
	Sig. (2-tailed)	0.006	0.036	0.046	0.000	0.000	0.747		0.778	0.000
	N	300	300	300	300	300	300	300	300	300
StructuralCondition	Pearson Correlation	0.110	.286**	.374**	.165**	.143*	.547**	0.016	1	.425**
	Sig. (2-tailed)	0.057	0.000	0.000	0.004	0.013	0.000	0.778		0.000
	N	300	300	300	300	300	300	300	300	300
Overall	Pearson Correlation	.271**	.313**	.258**	.267**	.281**	.513**	.201**	.425**	1
	Sig.	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	

	(2-tailed)									
	N	300	300	300	300	300	300	300	300	300

**. Correlation is significant at the 0.01 level (2-tailed).
*. Correlation is significant at the 0.05 level (2-tailed).

Pearson correlation is used in this study. Statistical significance at 0.01 level in 2- tailed t-test is conducted. From the above Table, last row of overall condition is most important to observe. It is found that, Fare expenditure, On borad security, Bus frequency, Bus stuff behavior, Interior cleanness, Route information and Structural condition have statistcal signicant relation with overall. However, seat comfort have only r value 0.106 which is not statical signicant at 0.05 level in 2-tailed t-test (value of signicance level 0.068). Correlation of overall condition with other attributes or independent variables are presented seperately for better understanding.

Table 5.11: Correlation of overall condition with other variables

Overall		
Variables	Pearson Correlation	Sig. (2-tailed)
Fare Expenditure	$.271^{**}$	0.000
Seat Comfort	$.313^{**}$	0.000
Onboard Security	$.258^{**}$	0.000
Bus Frequency	$.267^{**}$	0.000
BusStaffBehavior	$.281^{**}$	0.000
InteriorCleanness	$.513^{**}$	0.000
RouteInformation	$.201^{**}$	0.000
StructuralCondition	$.425^{**}$	0.000
Overall	1	

Since, all of the independent variables are statistically significant at 0.05 level. Therefore, Fare expenditure, seat comfort, On borad security, Bus frequency, Bus stuff behavior, Interior cleanness, Route information and Structural condition variables (attribute) are included in the statistical model building.

Descriptive statistics

Descriptive statistics are brief descriptive coefficients that summarize a given data set, which can be either a representation of the entire or a sample of a population. Descriptive statistics are broken down into measures of central tendency and measures of variability (spread). Measures of central tendency include the mean, median, and mode, while measures of variability include the standard deviation. Average and standard deviation of dependent and independent variables are presented in the following table.

Descriptive Statistics			
	Mean	Std. Deviation	N
Fare Expenditure	2.70	0.80	300
Seat Comfort	2.82	0.89	300
Onboard Security	2.74	0.95	300
Bus Frequency	2.99	0.91	300
BusStaffBehavior	2.65	0.90	300
InteriorCleanness	2.75	0.89	300
RouteInformation	2.98	0.75	300
StructuralCondition	2.86	0.90	300
Overall	2.97	0.62	300

Table 4.12: Descriptive statistics

Average and standard deviation of dataset are presented graphically in the following Figure.

Figure 5.10: Descriptive statistics of explanatory variables
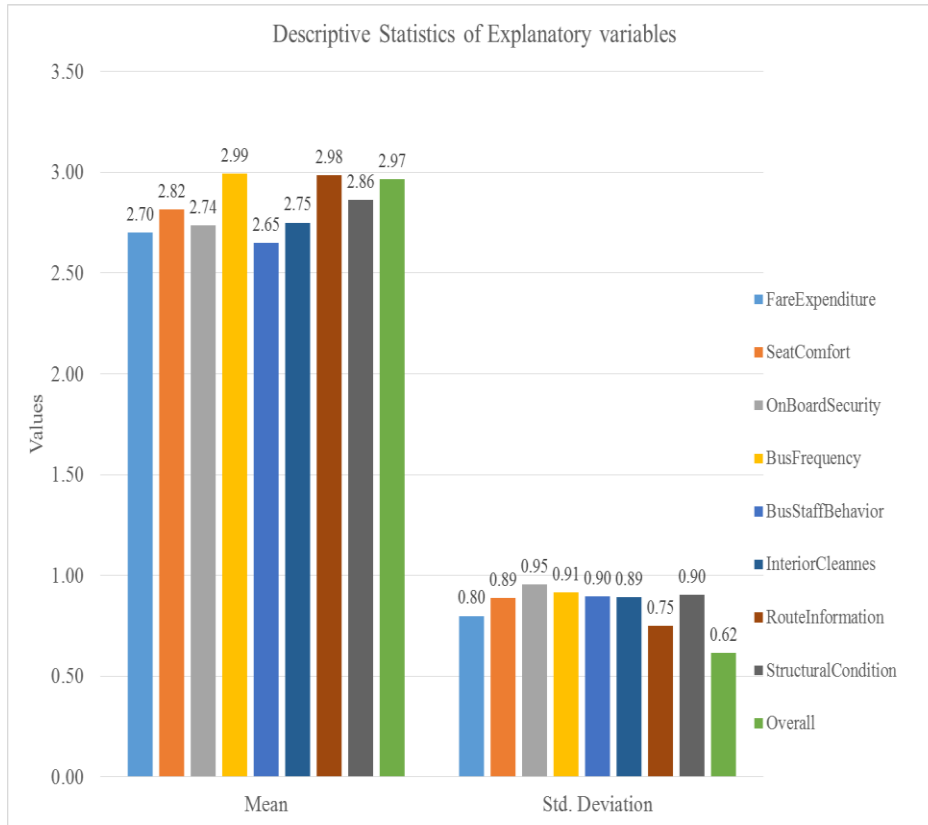
The above Figure 5.10 shows that On board security has maximum standard deviation of 0.95. Overall condition has lowest standard deviation (value = 0.62). Bus frequency has highest average 2.99 score, whereas, Bus staff behavior has lowest average 2.65 score. Considering all variables, average score ranges from 2.65 to 2.99. Standard deviation ranges from 0.62 to 0.95.

Model 1

Independent variables in Model 1 are Fare expenditure, seat comfort, On borad security, Bus frequency, Bus stuff behavior, Interior cleanness, Route information and Structural condition. Dependent variable is overall condition.

Table 5.13: Summary of Model 1

Case Processing Summary

		N	Marginal Percentage
Ove rall	1	3	1.0%
	2	52	17.3%
	3	198	66.0%
	4	46	15.3%
	5	1	.3%
Valid		300	100.0%
Missing		0	
Total		300	
Subpopulation		246[a]	

a. The dependent variable has only one value observed in 237 (96.3%) subpopulations.

The Figure 5.11 represents predicted overall condition in Model 1. Among them very poor condition is 1% and very good condition response is only 0.3%. Large portion of respondents are average which is 66%. Poor and good response are 17.3% and 15.3% respectively.
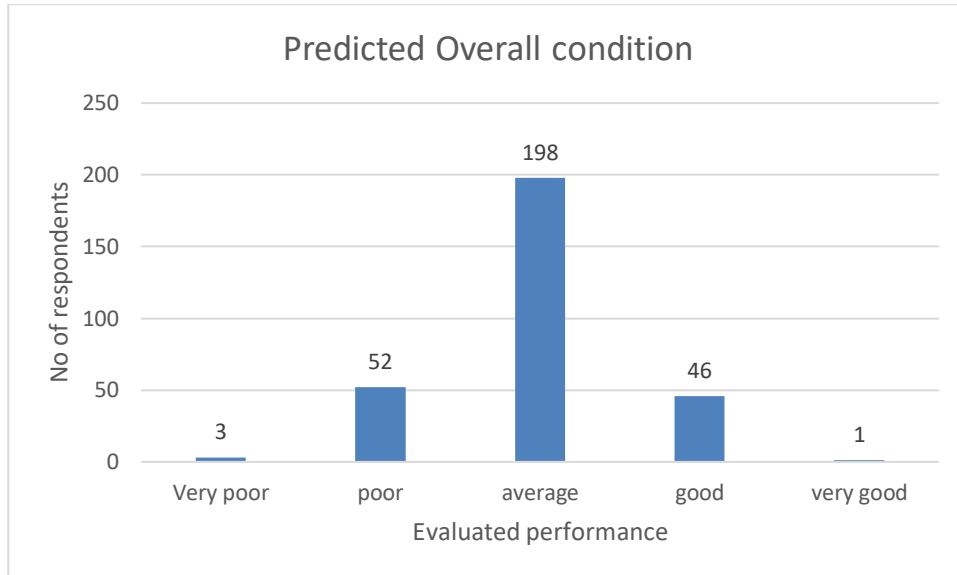
Figure 5.11: Predicted Overall condition

Table5.14 shows that Final model which contain eight independent variables are statistically significant and null hypothesis is rejected. It means that adding the variables compare to intercept only (non- model) increase prediction performance of the model. Inclusion of variables enhances the prediction capacity of the model.

Table 5.14: Model Fitting

Model Fitting Information

Model	Model Fitting Criteria	Likelihood Ratio Tests		
	-2 Log Likelihood	Chi-Square	df	Sig.
Intercept Only	543.450			
Final	358.366	185.084	32	.000

Table 5.15 shows that both Pearson and Deviance Goodness of fit tests Model 1 is statistically insignificant. It means that null hypothesis is accepted and predicted value in Model 1 fits with given survey data.

Table 5.15: Goodness of fit

Goodness-of-Fit

	Chi-Square	df	Sig.
Pearson	533.687	948	1.000
Deviance	345.183	948	1.000

In the following Table 5.16, Pseudo R2 value of Model 1 are given. Ranges of Cox and Snell varies from 0 to 0.1 and Nagelkerke ranges from 0 to 0.75. Model 1 has variability of 46.0% in case of Cox and Snell method.

Pseudo R-Square

Cox and Snell	.460
Nagelkerke	.545
McFadden	.331

Table 5.16: Pseudo R^2

Table5.17: Likelihood ratio tests

Likelihood Ratio Tests

Effect	Model Fitting Criteria	Likelihood Ratio Tests		
	-2 Log Likelihood of Reduced Model	Chi-Square	df	Sig.
Intercept	4.672 E2[a]	108.808	4	.000
Fare Expenditure	3.724 E2[a]	14.064	4	.007
Seat Comfort	3.588 E2[b]	.395	4	.983
Onboard Security	3.612 E2[a]	2.882	4	.578
Bus Frequency	3.588 E2[a]	.476	4	.976
BusStaffBehavior	3.675 E2[a]	9.131	4	.058
InteriorCleanness	382.533	24.167	4	.000
Route Information	3.720 E2[a]	13.675	4	.008
Structural Condition	3.787 E2[a]	20.319	4	.000

The chi-square statistic is the difference in -2 log-likelihoods between the final model and a reduced model. The reduced model is formed by omitting an effect from the final model. The null hypothesis is that all parameters of that effect are 0.

a. Unexpected singularities in the Hessian matrix are encountered. This indicates that either some predictor variables should be excluded or some categories should be merged.

b. There is possibly a quasi-complete separation in the data. Either the maximum likelihood estimates do not exist or some parameter estimates are infinite.

Likelihood test ratio in Table 5.17 shows that, Fare Expenditure, Interior Cleanness, Route Information and Structural condition of bus are statistically significant at α = 0.05 level. However, Seat comfort and, on board security and Bus frequency have very low Chi-square value. Bus staff behavior is statistically insignificant at α = 0.05 level (p= 0.058).

Parameter estimates are shown in Table 5.18.

Based on Table 5.17 likelihood values of attributes (parameters), those are ranked in the following manner in Table 5.19.

Table 5.19: Rank of attributes in Model 1

Rank	Attributes
3	Fare Expenditure
8	Seat Comfort
6	Onboard Security
7	Bus Frequency
5	BusStaffBehavior
1	Interior Cleanness
4	Route Information
2	Structural Condition

It means that most importance should be given to the interior cleanness and structural condition. Concerned authority can give less priority on Bus frequency and seat comfort considering present Service quality (SQ) scenario of public bus in Dhaka city. Large number of bus plying on the roads of Dhaka, therefore, there is no shortage of bus at present and bus commuter give seat comfort less preference. Since, urban bus commuter travel for short duration they less bother for seat comfort level. Bus commuters have serious objection or concern on interior cleanness, structural condition, fare expenditure and route information, which are the top four ranked attributes. Table 5.19 shows the classification of Model 1. Model 1 predicts with 72.3% accuracy. Among which, it can predict poor (score 1) and very good (score 5) with 100% accuracy. Since, these scores have very small number of data, the prediction is 100% accurate. The Model 1 can predict average response (score 3) with 89.4% accuracy.

Table5.19: Classification

Classification

Observed	Predicted					
	1	2	3	4	5	Percent Correct
1	3	0	0	0	0	100.0%
2	0	18	34	0	0	34.6%
3	0	11	177	9	1	89.4%
4	0	0	28	18	0	39.1%
5	0	0	0	0	1	100.0%
Overall Percentage	1.0%	9.7%	79.7%	9.0%	.7%	72.3%

Model 2

Model 2 has four attributes, those are interior cleanness, structural condition, fare expenditure and route information. Other four attributes—seat comfort, on board security, bus frequency and bus stuff behavior are found statistically insignificant in Model 1. Therefore, those are discarded in the Model 2.

Table 5.20: Case Summary of Model 2

Case Processing Summary

		N	Marginal Percentage
Overall	1	3	1.0%
	2	52	17.3%
	3	198	66.0%
	4	46	15.3%
	5	1	.3%
Valid		300	100.0%
Missing		0	
Total		300	
Subpopulation		94[a]	

a. The dependent variable has only one value observed in 66 (70.2%) subpopulations.

Model 2 predicts 66% response as average. 17.3% and 15.3% response as poor and good respectively.

Table 5.21 shows model fitting information of Model 2. The final model is statistically significant at α =0.05 level. It means that, inclusion of variables enhance prediction accuracy of the model 2 compare to non-model with intercept only case.

Table 5.21: Model fitting

Model	Model Fitting Criteria	Likelihood Ratio Tests		
	-2 Log Likelihood	Chi-Square	df	Sig.
Intercept Only	416.560			
Final	256.310	160.250	16	.000

Goodness of fit test by Pearson and Deviance method show that the proposed Model 2 accepts the null hypothesis that the predicted data are statistically significant.

Table 5.22: Goodness of fit

Goodness-of-Fit

	Chi-Square	df	Sig.
Pearson	279.811	356	.999
Deviance	198.387	356	1.000

Pseudo R^2 value obtained by Cox and Snell method and Nagelkerke method for Model 2 is 0.414 and 0.49. According to Cox and Snell method Model 2 can explain 41.4% variability of dataset.

Table 5.23: Pseudo R^2

Pseudo R-Square

Cox and Snell	.414
Nagelkerke	.490
McFadden	.287

Likelihood test ratio of Model 2 represent that all the four attributes are statistically significant.

Table 5.23: Likelihood ratio tests

Likelihood Ratio Tests

Effect	Model Fitting Criteria -2 Log Likelihood of Reduced Model	Likelihood Ratio Tests Chi-Square	df	Sig.
Intercept	366.288	109.978	4	.000
Fare Expenditure	282.854	26.544	4	.000
InteriorCleanness	301.789	45.478	4	.000
Route Information	273.160	16.850	4	.002
Structural Condition	282.587	26.277	4	.000

The chi-square statistic is the difference in -2 log-likelihoods between the final model and a reduced model. The reduced model is formed by omitting an effect from the final model. The null hypothesis is that all parameters of that effect are 0.

Later the attributes are ranked based on Likelihood estimation and Chi-square value. Among them, interior cleanness is most important attribute, which require most attention and Fare expenditure is second most influencing attributes.

Table 5.24: Rank of attributes in Model 2

Rank	Attributes
2	Fare Expenditure
1	Interior Cleanness
4	Route Information
3	Structural Condition

Table 5.25 shows the estimated parameters in Model 2.

Table5.25: Parameter estimates

Parameter Estimates

Overall		B	Std. Error	Wald	df	Sig.	Exp(B)	95% Confidence Interval for Exp(B) Lower Bound	Upper Bound
1	Intercept	33.137	1.224E4	.000	1	.998			
	Fare Expenditure	34.921	2.214	248.697	1	.000	1.466E15	1.910E13	1.124E17
	InteriorCleanness	-137.464	7254.286	.000	1	.985	1.996E-60	.000	.b
	Route Information	-17.013	2544.949	.000	1	.995	4.085E-8	.000	.b
	Structural Condition	34.160	.000	.	1	.	6.848E14	6.848E14	6.848E14
2	Intercept	20.781	18.647	1.242	1	.265			
	Fare Expenditure	1.039	1.320	.619	1	.431	2.825	.213	37.530

		B	Std. Error	Wald	df	Sig.	Exp(B)	Lower Bound	Upper Bound
	Interior Cleanness	-5.847	4.265	1.879	1	.170	.003	6.765E-7	12.335
	Route Information	-1.004	3.329	.091	1	.763	.367	.001	249.944
	Structural Condition	1.238	1.470	.709	1	.400	3.450	.193	61.565
3	Intercept	15.137	18.611	.662	1	.416			
	Fare Expenditure	1.258	1.295	.944	1	.331	3.519	.278	44.520
	InteriorCleanness	-4.690	4.256	1.214	1	.270	.009	2.192E-6	38.535
	Route Information	-.279	3.320	.007	1	.933	.756	.001	506.506
	Structural Condition	1.870	1.452	1.659	1	.198	6.487	.377	111.618
4	Intercept	4.682	18.639	.063	1	.802			
	Fare Expenditure	2.205	1.319	2.797	1	.094	9.074	.684	120.279
	Interior Cleanness	-4.236	4.260	.989	1	.320	.014	3.421E-6	61.138
	Route Information	.360	3.326	.012	1	.914	1.433	.002	971.019
	Structural Condition	2.720	1.474	3.404	1	.065	15.180	.844	273.039

a. The reference category is: 5.00.

b. Floating point overflow occurred while computing this statistic. Its value is therefore set to system missing.

In the following Table 5.26 represents the accuracy of classification of Model 2.

Table 5.26: Classification

Classification

Observed	Predicted					Percent Correct
	1	2	3	4	5	
1	2	0	1	0	0	66.7%
2	0	15	36	1	0	28.8%
3	3	8	176	11	0	88.9%
4	0	0	30	16	0	34.8%
5	0	0	1	0	0	.0%
Overall Percentage	1.7%	7.7%	81.3%	9.3%	.0%	69.7%

Model 2 has overall accuracy of 69.7% and maximum accuracy obtained in average response (88.9%). Whereas, the Model 2 has 0% accuracy in case of very good response, though the data sample is only 1 (negligible).

Comparison of Model 1 and Model 2

Both Model 1 and Model 2 are statistically significant. Model 1 has eight attributes, those are—fare expenditure, seat comfort, On borad security, Bus frequency, Bus stuff behavior, Interior cleanness, Route information and Structural condition. On contrary, Model 2 has four attributes only, those are--fare expenditure, Interior cleanness, Route information and Structural condition. All attributes of Model 2 are statistically significant at $\alpha = 0.05$ level. However, four attributes, such as, seat comfort, On borad security, Bus frequency and Bus stuff behavior are statistically insignificant at $\alpha = 0.05$ level. Model 1 has log likelihood value 358.366 and Chi-square value 185.084. On contrary, Model 2 has log likelihood value 256.31 and Chi-square value 160.25. In both cases, Model 2 is more preferable than Model 1. Model 1 has Pearson and Deviance goodness of fit value 533.687 and 345.183 respectively. Model has

Pearson and deviance goodness of fit value 279.811 and 198.387 respectively. Model 2 fits with the survey data better

than Model 1. Considering Cox & snell and Nagelkerke pseudo R^2 values Model 1 show 0.46 and 0.54 respectively. In case of Model 2, the above mentioned pseudo R^2 values are 0.414 and 0.49 respectively. Model 1 can predict the variability of dataset better than Model 2. Classification matrix show that Model 1 and Model 2 have prediction accuracy of 72.3% and 69.7% respectively. Interior cleanness and structural condition of buses are the most important attribute for Model 1, whereas, Interior cleanness and Fare expenditure are ranked top for Model 2. Interior cleanness is first most important feature in both models in terms of Log-likelihood and Chi-square test values.

Table 5.27: Comparison of Model 1 and Model 2

	log likelihood	Chi-square	Pearson goodness of fit	deviance goodness of fit	Cox &snell Pseudo R^2	Nagelkerke pseudo R^2	Accuracy
Model 1	358.366	185.084	533.687	345.183	0.46	0.54	72.30%
Model 2	256.31	160.25	279.811	198.387	0.414	0.49	69.70%

Table 5.28: Comparison of ranking attributes

	Model 1	Model 2
Rank	Attribute	Attribute
1	Interior Cleanness	Interior Cleanness
2	Structural Condition	Fare Expenditure
3	Fare Expenditure	Structural Condition

	Route	Route
4	Information	Information

Ranks of attributes are prepared from log likelihood and chi square value obtained from log likelihood ratio test. The more log likelihood and chi square value, the more the attribute is more important in the model.
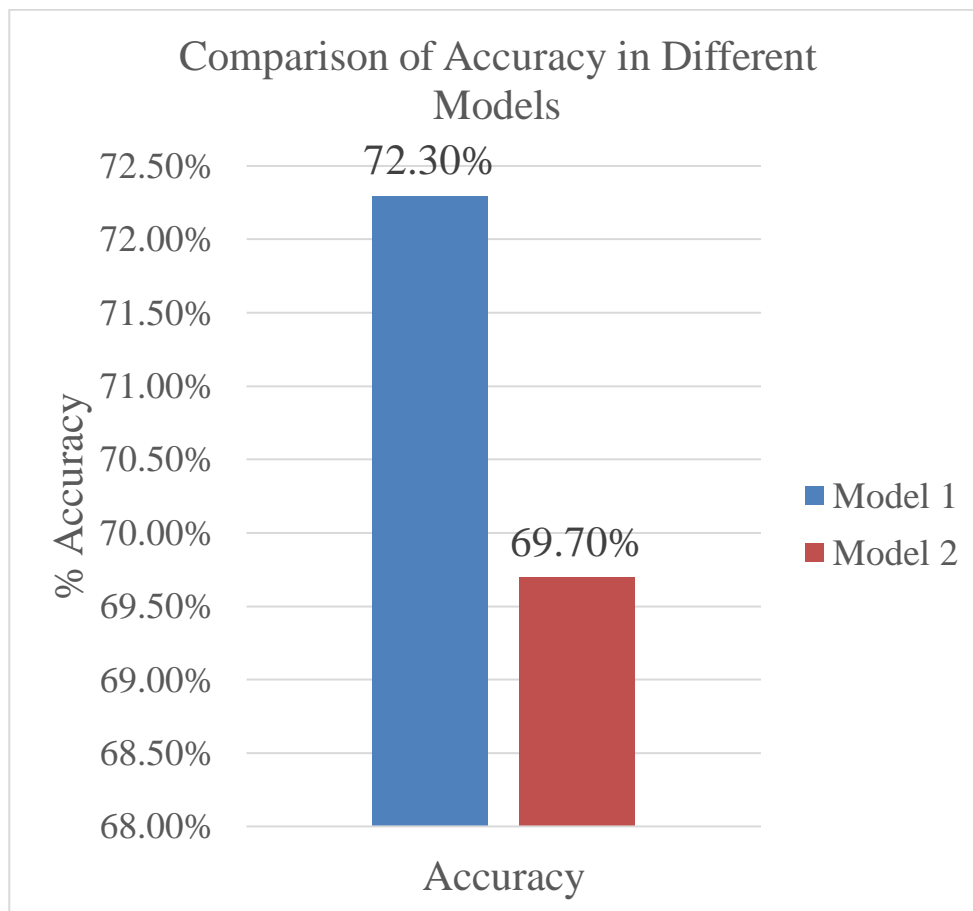
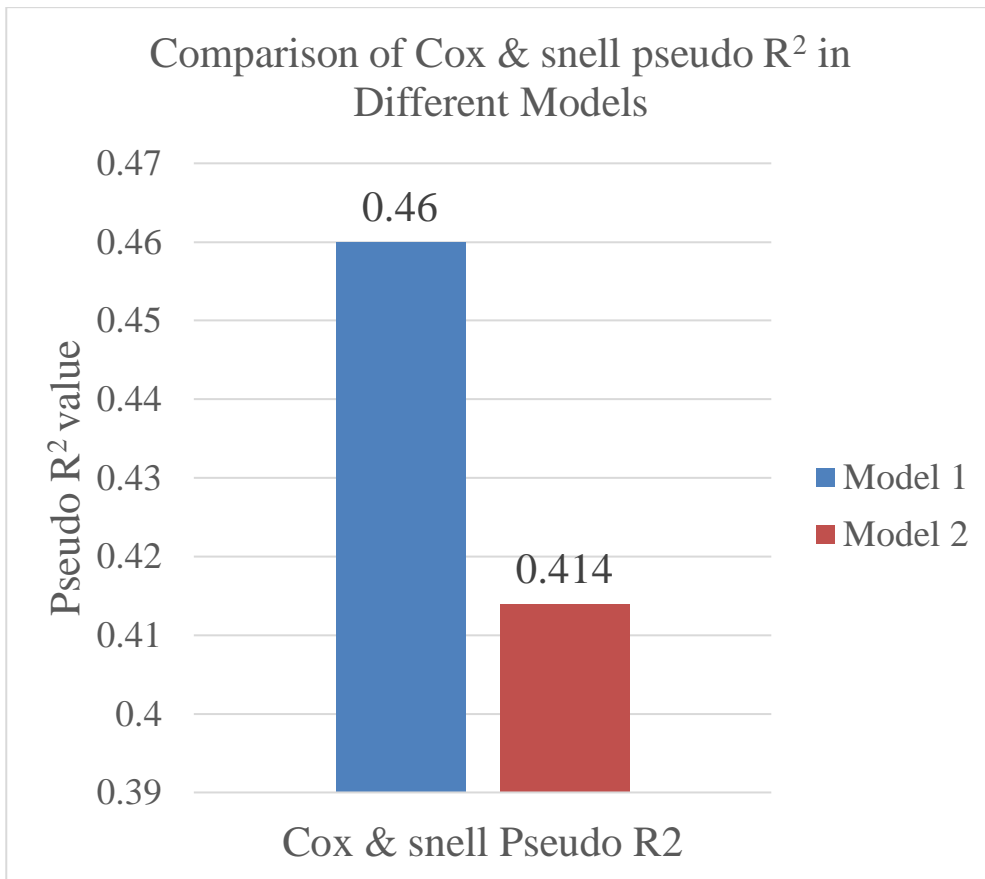

Figure 5.12: % Accuracy in different statistical models

Figure 5.13: Comparison of pseudo R^2 in different models

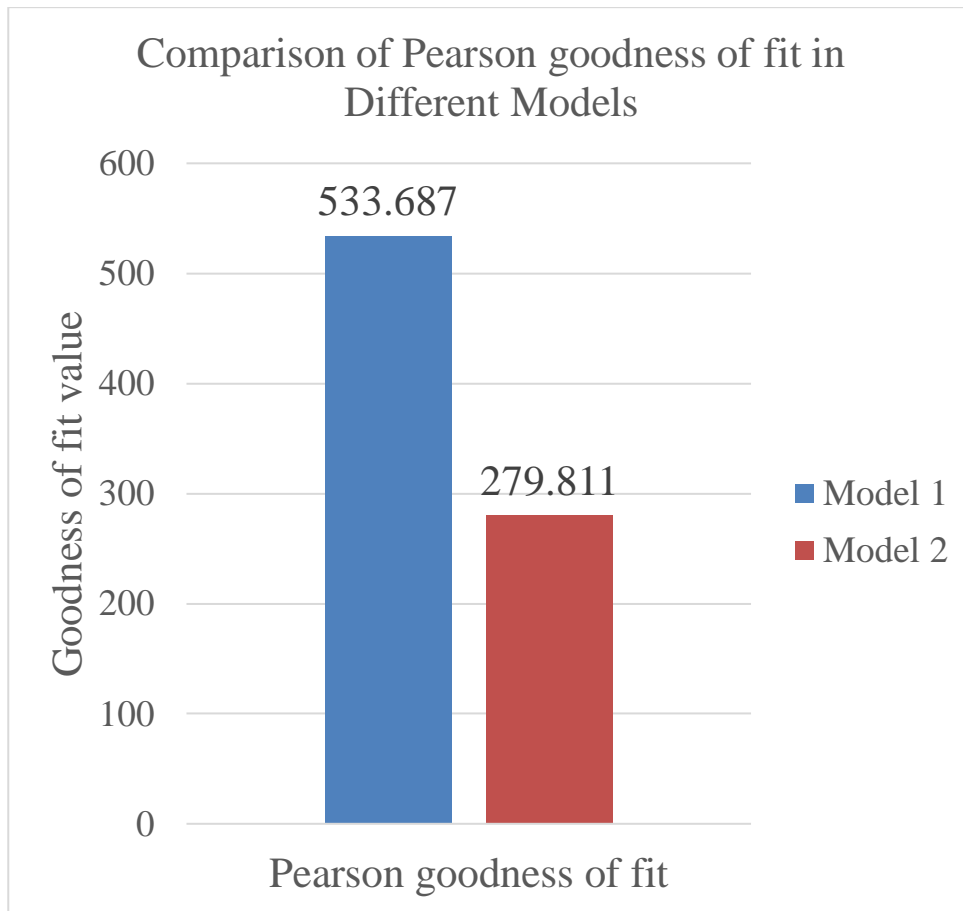Model 1 can describe 46% and Model 2 can describe 41.4% variability of survey data.

Figure 5.14: Comparison of goodness of fit between two models

The less goodness of fit value, the more the predicted value match with surveyed value (observed data

% Relative influence of attributes i.e. independent variables for Model 1 is presented in the Figure 5.15.

Route information, Structural Condition and Fare expenditure are 97.26%, 98.99% and 97.36% compare

to Interior cleanness. The relative influence are calculated based on log likelihood values of parameters
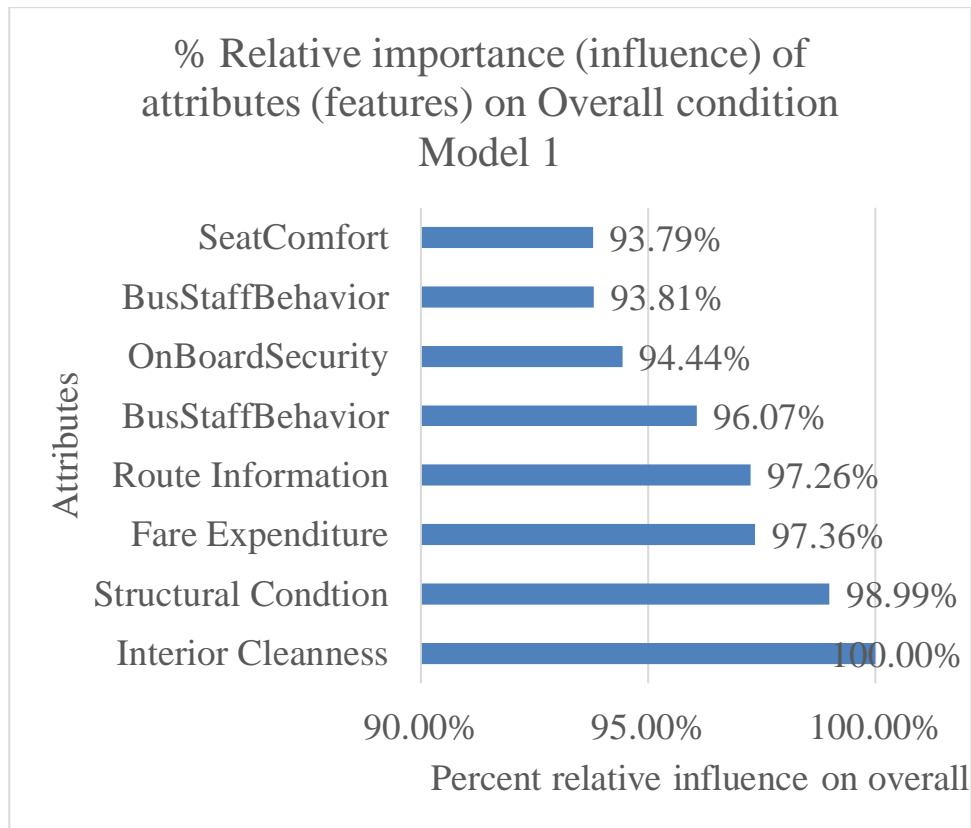
obtained by log likelihood ratio test.

% Relative importance (influence) of attributes (features) on Overall condition Model 1

Figure 5.15: % Relative influence of attributes on Overall condition for Model 1% relative influences of attributes i.e. independent variables for Model 2 are presented in the Figure 5.16. Route information, Structural Condition and Fare expenditure are 90.51%, 93.64% and 93.73% compare to Interior cleanness

% Relative importance (influence) of attributes (features) on Overall condition Model 2

- Route Information: 90.51%
- Structural Condtion: 93.64%
- Fare Expenditure: 93.73%
- Interior Cleanness: 100.00%

(x-axis: 85.00%, 90.00%, 95.00%, 100.00%)

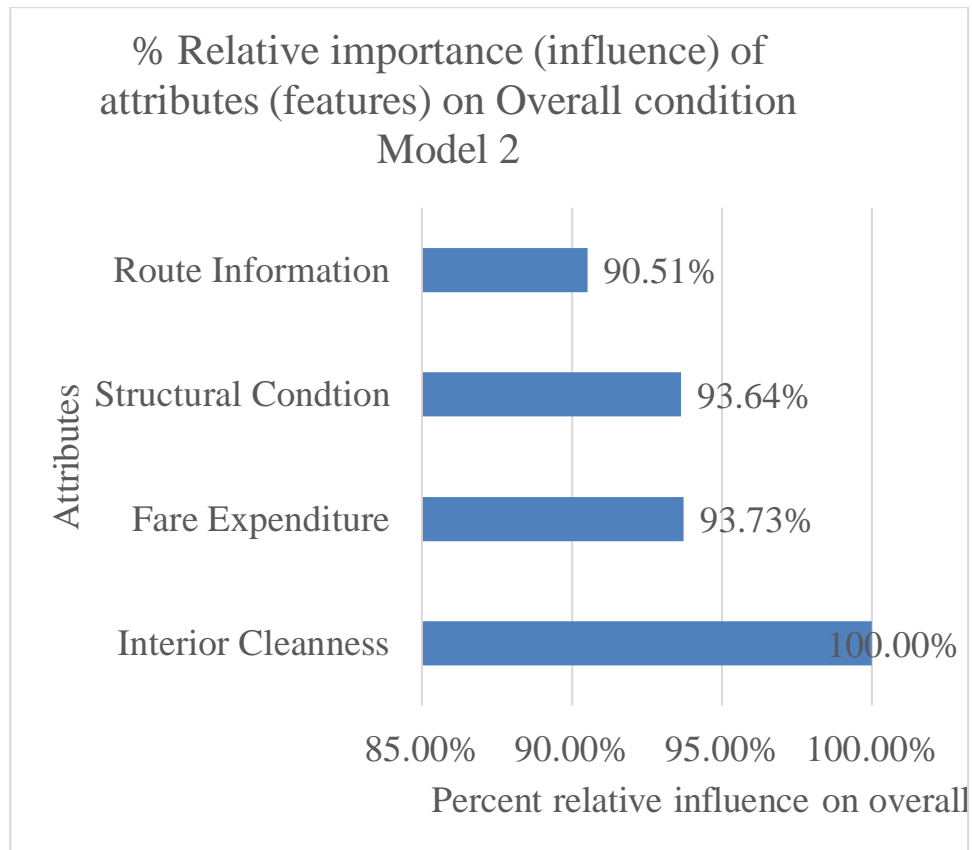Percent relative influence on overall

Attributes

Figure 5.16: % Relative influence of attributes on Overall condition for Model 2

P-P Plot of Overall Condition is shown in Figure 5.16. If P-P Plot data point match with 45° line (marked in red), the actual probability and predicted probability match perfectly. The data points above 45° line of P-P plot indicate predicted values are over estimated and data points below of 45° line of P-P plot indicate predicted values are under estimated. Comparing Model 1 and Model 2, some data points of Model 2 deviate very largely compare to Model 1.
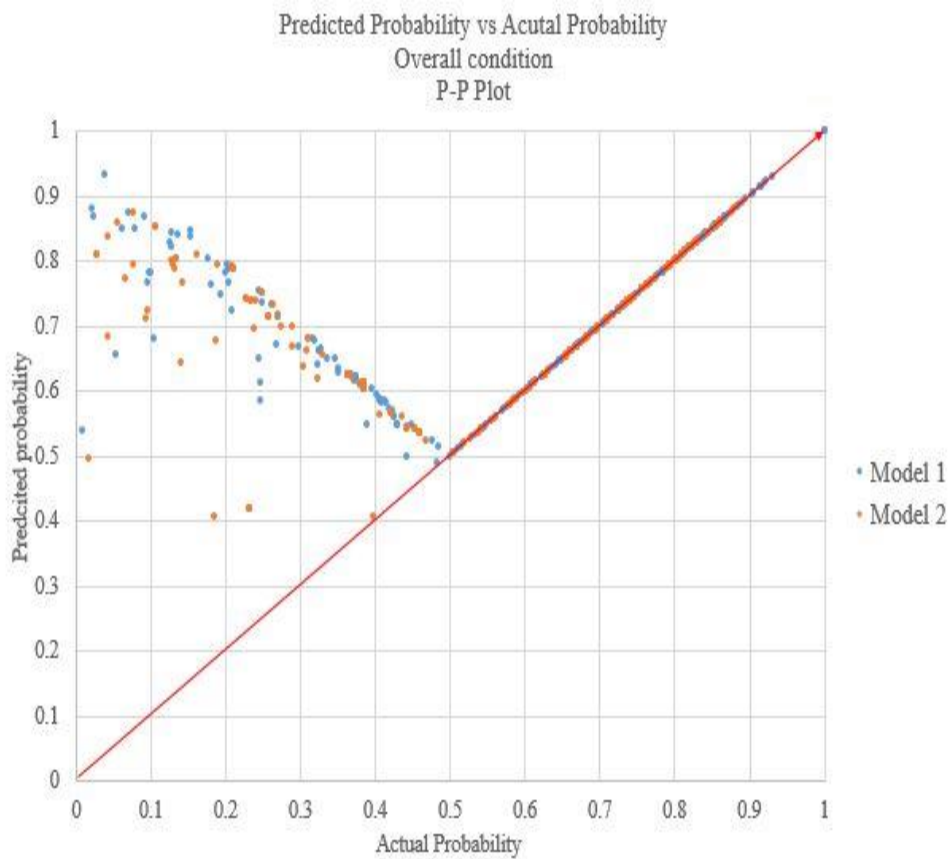
Figure 5.16: P-P Plot of Overall condition

5.3. Results

➢ Model 1 and Model 2 have 72.3% and 69.7% prediction accuracy.

➢ Model 1 can describe 46% and Model 2 can describe 41.4% variability of survey data.

➢ Model 1 shows that the orders of influence (rank) of attributes on overall condition are interior cleanness, structural condition, fare expenditure and route information.

➢ Model 2 shows that the orders of influence (rank) of attributes on overall condition are interior cleanness, fare expenditure, structural condition, and route information.

➢ Overall condition scored 2.97 which is slightly below average.

5.4. Future Study

➢ Effects of heterogeneity of demographics, such as, age, gender, income and occupation on responses can be studied.

➢ The study can be extended to various other locations in the city.

➢ Comparative study with other mode of transport, such as, private car can be investigated.

➢ The survey can be performed over large number of commuter to understand actual scenario better.

It means that most importance should be given to the interior cleanness and structural condition. Concerned authority can give less priority on Bus frequency and seat comfort considering present Service quality (SQ) scenario of public bus in Dhaka city. Large number of bus plying on the roads of Dhaka, therefore, there is no shortage of bus at present and bus commuter give seat comfort less preference. Since, urban bus commuter travel for short duration they less bother for seat comfort level. Bus commuters have serious objection or concern on interior cleanness, structural condition, fare expenditure and route information, which are the top four ranked attributes. Table 5.19 shows the classification of Model 1. Model 1 predicts with 72.3% accuracy. Among which, it can predict poor (score 1) and very good (score 5) with 100% accuracy. Since, these scores have very small number of data, the prediction is 100% accurate. The Model 1 can predict average response (score 3) with 89.4% accuracy.

Chapter-6

Conclusion and Recommendation

6.1. Introduction

This is the ending chapter of the thesis. This chapter presents the concluding remarks about thestudy and some of the recommendations found from the study. This chapter also highlights thefindings from the study and the limitations of the study.

6.2. Summary

Service quality for public bus transport in Dhaka city is unsatisfactory and undesirable. Thoughthe study considered only the Abdullahpur-Motijheel bus route, the picture is more or less the same for all other public bus routes in Dhaka. High number of standees, complete absence of scheduled operation, zero maintenance, lack of skilled drivers, risky boarding and alighting operations are the most common features of the present bus service. The study comparedbetween general non ticket based bus services, termed as „local bus‟, to ticket based air-condition bus service. In most of the aspects the local bus service score was lower than aircondition bus service. In all the on-board facilities air condition bus service was a clear winner.But in case of waiting times and bus fare, local buses have more positive feedbacks than the air-condition buses. Users‟ responses for bus stop facilities were a sorry tale. Many of therespondentsdidn't even consider it usable. Many of them were unaware of its presence. Theirresponses for bus stops were very negative. Overall, the study presented a overview ofpassengers responses for the particular bus route.Findings from the study

The findings from the study have been presented below:

• A clear distinction between local bus and air condition bus service was with its insidecleanliness. Some of the local buses had almost a slum like appearance which was not at allexpected from a city bus service.

• Some of the local buses didn't have organized seats. It seemed that they like to increase thenumber of seat even by reducing the leg space for passengers.

• Regular bus passengers complained much about service breakdowns for local as well as airconditioned buses. This indicated that there is no effective maintenance schedules for bothlocal and air condition buses

• Emergency service facilities like emergency doors, fire extinguishers were completelymissing from most of the local buses. Some double-decker local buses had emergency doorsbut they were used for regular passenger boarding and alighting services. On the other hand,all the air condition buses have emergency doors. Many of them had fire extinguishersmissing.

• Even though the fare for air conditioned buses were clearly higher than the local buses, thefare feedback from the passengers didn't indicate remarkable difference in their opinions.This was mainly due to the fact that air condition bus users were more economically solventand they were not too unhappy with the service with regard to the fare rate.

• From the passengers" responses it was known that the double-decker BRTC buses wereinitially ticket based. But now in this concerned route they operate without tickets. ThisIndicates that their service has degraded in many aspects.

• During study it was observed that though air condition bus service was ticket based, some ofthe passengers were getting in the bus by paying money to the bus drivers. This was anillegal way of operation. This would likely to make the company unprofitable in the future.

• One positive side that local buses had was that their numbers were higher than theair-condition buses. The passengers had to wait for less time for local buses than for aircondition buses

• The local buses didn't only take passengers from the bus stops but from anywhere they liked.This made the service more accessible to the passengers than the air condition bus service.

6.3. Recommendations

The study provides several recommendations for improving public bus service quality.Recommendations regarding future study have also been presented here. The recommendationshave been presented below: Recommendations from the Studyto improve service quality following recommendations has been pointed out:from passenger's response the first priority for service improvement for local buses was

Found to be improvement to bus. So, the first thing that needs to be done is to improvelocal bus service is to improve on-board facilities.For air condition buses, passenger's first priority was found to be to increase number of bus. So, to meet the passengersservice demand the first thing to be done to improve aircondition bus service is to increase number of bus. In order to improve the ride quality only licensed drivers should be allowed to drive on theroad. The present rule is also for this but the rule is not strictly imposed.To keep on-board facilities usable and at the satisfactory level of the passengers regularmaintenance of on-board bus facilities is to be ensured. To reduce the number of bus breakdowns routine checking of buses by mechanics must bedone. There should be a law to enforce this maintenance work There should be strict application of rules to remove unfit vehicles form service.There should be government regulations to ensure that buses meet the bus procurement guidelines. Role of private sector in providing sustainable and competitive service is to beacknowledged. There should be strict regulation from government's side to ensure that bus agencies providetheir service to customers as they were aimed to provide. A provision for easy complain booth were service users can leave their complains to be addressed by the concerned authorities. A comprehensive framework for evaluation of service by passengers and clear structure forvaluing their responses. Strict and up to date guidelines for selecting bus service providers so that it can be expectedthat qualified service providers have been selected. There should be an immediate increase in number of buses in the specific route. There should be a continuous effort for finding a suitable means to make public bus transporthazard free and less time consuming. Provision of clearly designated bus stops with clean appearance and basic facilities for thebus passengers.Recommendations for Future Study

☐ The study tries to evaluate the service quality from only passengers perspective. If the studyis done in combination with service quality from operators" perspective then the completepicture of service quality can be understood.

☐ In this study some of the most common factors for bus stop facilities form users perspectiveshave been presented. If the study is used along with design features of bus stops a good busstop is likely to be constructed which will satisfy both the designers and the service users.

☐ The study presented that on-board facilities are the most disliked part while in the ride.Future studies should give a more detail analysis in this aspect.

☐ The study couldn't compare the results with the results of any other countries of the world.Future research should try to develop a means for comparison of the results.

6.4. Limitations of the Study

☐ the study failed to consider all the bus services within the selected route. To get the totalpicture of service quality all the bus service providers should have been included

☐ Due to resource and time limitation not enough questionnaire responses were collected. Moreresponses would have add more to the validity of the data analysis

☐ One limitation of such questionnaire studies is that interpretation of data normally variesfrom researchers to researchers. So, results of such study may represent a relative outcome.

☐ The results obtained may not be representative to the total population using the service due tothe fact that judgment sampling was used to conduct the study.

☐ The study selected the parameters that were suitable to conduct such studies under theprevailing conditions of the transport system of the country. These parameters may not besuitable for similar studies across other countries of the world.

☐ The study results are more likely to represent the condition of bus service during the daytimeas most of the data were collected during the daytime. The service situation worsen up duringevenings as the bus operator reduces the number of bus in operation during the eveninghours.

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Appendix

Questionnaire Survey for B.Sc Thesis

Evaluation of City Bus Service Quality

Service Quality Assessment of Public Bus Service

Age   # Occupation : Student /House Wife/

                                           Service Holder/Businessman

#Gender   #Income Monthly

Attribute

1. **Very Poor**   1
2. **Poor**   2
3. **Average**   3
4. **Good**   4
5. **Very Good**   5

	Very Poor	Poor	Average	Good	Very Good
1.Fare Expenditure					
2. Seat comfort					
3. On Board Security					
4. Bus frequency					
5.Bus Staff Behavior					
6.Interior cleaners					
7.Route information					
8.Structural condition					
9.Overall					

1.The Bus fare (trip cost) is? a) Very High b) High c) Moderate d) Low e) Very Low.

2. The fare collection I prefer: a) Counter system b) Bus helper fare collection system

3. Do buses usually take passengers outside bus stop? a)yes b) no. .

4. How long do you wait at the bus stop usually?

i) 0-5 min ii) 6-10 min iii) 11-20 min iv) 21-30 min v) 30-40 min vi)more than 40 min.

5. Number of standees in bus (usually)?

i) Very high ii) High iii) Medium iv) Low iv) Very low.

6. Why do you use this bus service?

i) Less costly ii) Comfortable iii) Easier to get a busiv) Safer.