Comparative Post-Feasibility Studies of Circular, Semi-Circular and Local Bus in Dhaka City

Submitted by

Krishna Chandra Roy	**:**	**163-47-232**
Md. Shahabuddin Shehab	**:**	**163-47-241**
Muhammad Moshiur Rahman	**:**	**163-47-249**
Md. Nur Alam Siddik	**:**	**163-47-262**

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Comparative Post-Feasibility Studies of Circular, Semi-Circular and Local Bus in Dhaka City

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Prepared by:

Krishna Chandra Roy : 163-47-232

Md. Shahabuddin Shehab : 163-47-241

Muhammad Moshiur Rahman : 163-47-249

Md. Nur Alam Siddik : 163-47-262

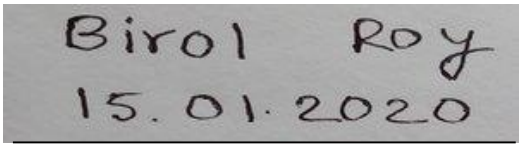
Supervisor: **Birol Roy**

Lecturer

Department of Civil Engineering.

Thesis Acceptance Form

The thesis titled 'Comparative Post-Feasibility of Circular, Semi-Circular and Local bus in Dhaka City' submitted by Md. Shahabuddin Shehab, ID No: 163-47-241; Krishna Chandra Roy, ID No: 163-47-232; Md. Nur Alam Siddik, ID No: 163-47-262; Muhammad Moshiur Rahman, ID No: 163-47-249 Session 2016-2017 has been accepted as satisfactory in partial fulfillment of the requirements for the degree of Bachelor of Civil Engineering.



Birol Roy

Supervisor and Lecturer

Department of Civil Engineering

Daffodil International University

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It is the kindness of almighty Allah, the most generous and the most merciful, who choose me and enable me to undertake such a massive task.

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I wish to express my deep sense sense of gratitude to all my teachers of Department of Civil Engineering for their benevolent cooperation and encouragement during the study. I appreciate the cordiality of the officials of bus owners associations, workers of the buses and passengers for their cooperations.

Dedication

This all work of thesis and project dedicated to our honorable supervisor Birol Roy who helped us a lot and inspired us to complete this work.

Thank you sir.

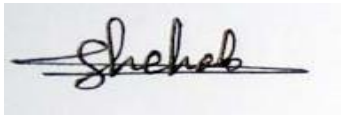
Abstract

City is just like a living organism and the transportation system is just like the blood circulation system of that living organism. Different motorized and non-motorized vehicles are seen running in street of Dhaka city to meet the transportation demand of the inhabitants of the city. Buses play an important role in Dhaka city for movement. Bus trips constitute 27% of total trips by mechanized model and passengers-kilometer traveled by bus is about 40% of passenger kilometer traveled by mechanized mode. Three types of buses. i.e. Circular, Semi-circular, Local buses under government or private ownership are rendering different types of services.

Considering different standard, it was revealed that local buses were taking too long time to complete a trip in Dhaka City. Passengers identified different problems of bus journey. According to the passengers 'Questionnaires Survey', 60% passengers considered the waiting time of buses at the stoppage was high, 62% considered the congestion within the bus was high and 66% agreed to increase the fare for better service.

Declaration

It is hereby declared that this thesis has been prepared in the partial fulfillment of the requirements for the degree of Bachelor of Civil Engineering in the Department of Civil Engineering, Daffodil International University, Dhaka, and this thesis or any part of it has not been submitted elsewhere for the award of any degree or diploma.

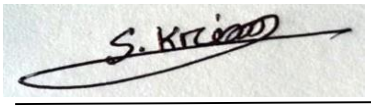


Md. Shahabuddin Shehab

ID: 163-47-241

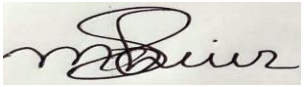
Md. Nur Alam Siddik

ID: 163-47-262



Krishna Chandra Roy

ID: 163-47-232



Muhammad Moshiur Rahman

ID: 163-47-249

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Chapter-1

1.1 Introduction:

Transportation plays an important role in the smooth functioning of a city. It is an integral facet of urban life. As the city grows, demand for the vehicles and new roadway facilities and new routes also arise. Different modes of different speed, capacity, hiring system and fare are seen in the city streets to suit the demand of various classes of passengers. Mass transit is patronized in the city to minimize traffic congestion, increase safety and reduce the use of car and parking space. It operates on established schedule along designated routes with specific stoppage.

The roads of Dhaka were never purpose-built to meet the present communication need. Reduction of tax in importing motor vehicles led to commencement of unprecedented and unexpected number of vehicles on the roads in the last ten years. With an increasing population, expanding urban areas, rising car ownership greater demand for space by every mode of transport, sharper and sharper traffic peaks and growing competition for land from every quarter, the performance of bus service continues to worsen.

1.2 Background and present state of the problem:

Dhaka, the administrative, commercial, cultural and industrial hub of Bangladesh is burdened with 17 million people. There is no city in the world exceeding 10 million populations, which could solve its transportation problem by keeping vehicles in one level. The multi-level transportation system usually consists of road network at ground level road network is available.

1.3 Objectives:

The main objective of the research is to investigate the performance of bus service in Dhaka city. Some indicators of performance of bus service are used to study the performance of the bus service in Dhaka. Indicators which affect the performance of bus service are travel time, travel speed, running time, waiting time at the stoppage, delay due to congestion, delay at the signals, average distance between stoppage, average waiting time of a passengers at the stoppages for getting a bus, congestion in the bus, number of trips a bus can complete a day, total distance a bus can cover every day, number of passengers-kilometer per bus per day.

1.4 Scope of the study:

The components of traditional transportation planning are as follows:

- Trip generation
- Trip distribution
- Trip assignment
- Modal choice

The objectives of the bus trips generation stage is to understand the reason behind the trip making behavior.

Trip distribution is the procedure utilized to distribute generated and attracted trips from each zone to any other zone.

Trip assignment is concerned with the trip maker choice of path between pairs of zone by travel mode and with the resulting vehicular flows on the multi modal transportation network.

Modal choice is concerned with the trip maker behavior regarding the selection of travel mode.

1.5 Methodology:

The methodology of the study is describe in the following step:

- **Literature survey:**

  In order to get the basic understanding on the topic, literature survey was undertaken and information was collected from published and unpublished sources. Different journals, thesis, study papers were studies for knowledge and information. Different books of transportation engineering and panning.

- **Route survey:**

  Route surveys were done to collect information an origin and destination of bus service, journey time components, terminal facilities, frequency of service, number of buses in the route, number of passengers carried per trip, stoppage, congestion, roadway components and various problems.

- **Passenger survey:**

  Simple questionnaires survey were conducted among the user of the buses. The aim of the survey was to study the nature of the problems they face and their proposals for the improvement of the system.

Flow Chart:

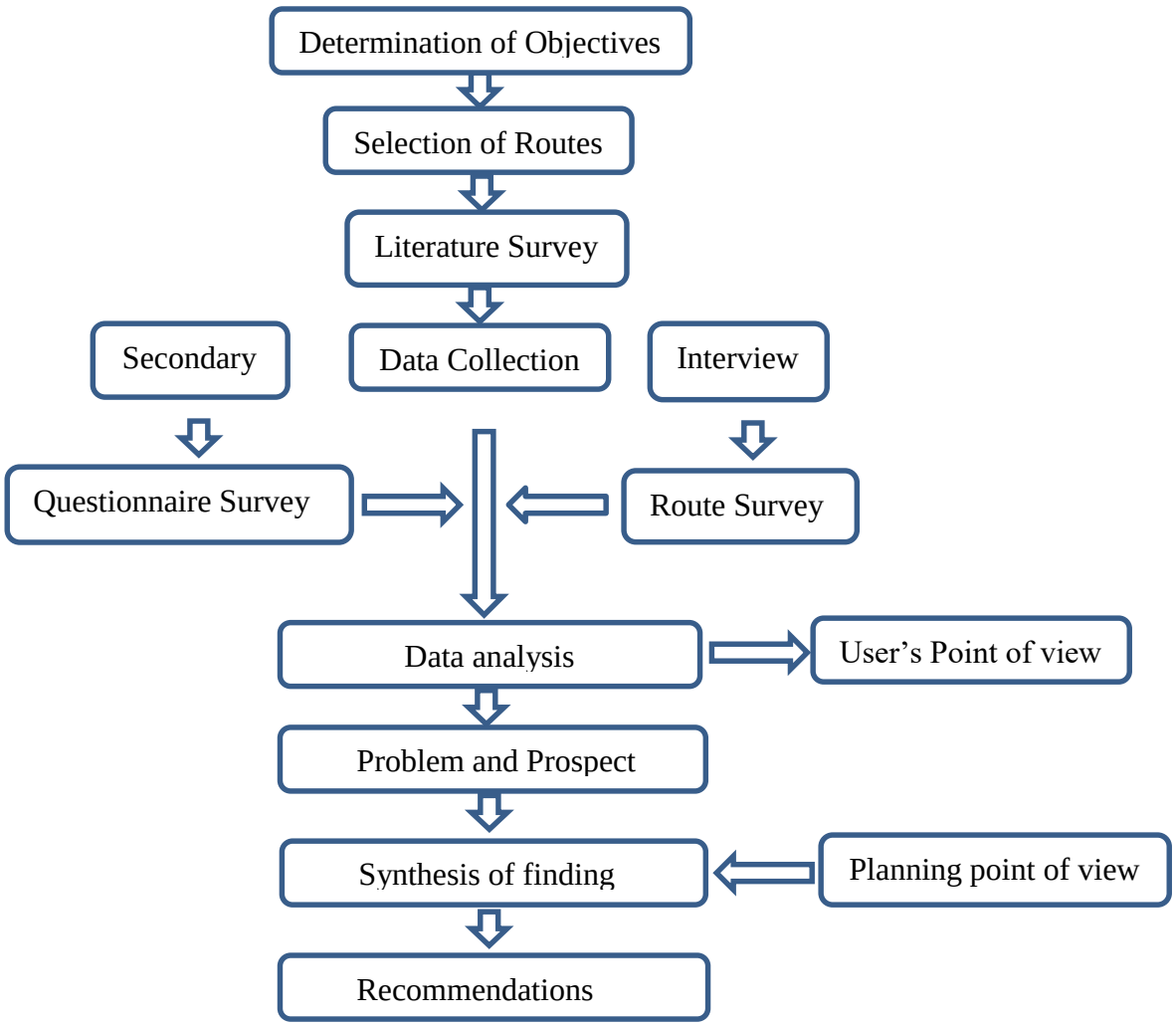

Figure 1.1: Methodology (Flow Chart)

Chapter-2

Literature Review

2.1 Introduction:

In conducting a research work, importance of literature review is beyond question. It helps to get comprehensive knowledge about the study topic. Moreover to ensure basic understanding of different aspect of the study, a literature review is of great importance. Different books as well published and unpublished journals and research papers. Which are relevant to the study were consultant. Internet searching was also done to get latest data and ideas. Unpublished data of different government organizations were also used for the study.

2.2 Review of past researches and studies:

A number of studies and researches were undertaken on transport system of Dhaka city by various government organization and educational and research institution. Similar types of researches were also undertaken in foreign countries.

Some of these relevant studies are studied here. Those studies can be broadly classified into two major groups. They are:

1. Planning and policy related studies:

In recent years, a significant study was greater Dhaka metropolitan area Integrated Transport Study (DITS). The study was undertaken by planning commission to improve the transport services in greater Dhaka. It developed a sound database about the elements of transport sector of greater Dhaka metropolitans. It used to assess the performance of bus operating enterprises, different performance indicator like passengers per bus per day. Km per bus per day, km per hour (Average of peak and off-peak), productive time, unproductive time (percentages of bus operating hours which is spent idle at terminal), fleet utilization, fleet ability, staff to bus ratio, fuel combustion, dead mileage, breakdown in service number off accident per 100,000 km.

2. Studies on Urban public transportation.

2.3 Factor affecting efficiency of bus service:

The attractiveness of bus transport service to the passengers depends on various factors like cheapness of the bus fare, time taken to complete a trip, waiting time of the passengers at the stoppage (Which should not usually be more than 5 minutes), waiting time of the buses at the stoppage , walking distance from the bus stoppage to origin or destination (Should preferably be not more than a quarter mile), frequency of bus service, regularity of the service, overcrowding within the

buses, safety, cleanliness. Crew behavior, conform, safety in boarding and alighting from buses and waiting in the stoppages.

The bus service providers, especially the owners of the buses always try to maximize their profit from the services. Income and return from the investment should be good enough so that the investors may be tempted to invest in the sector. The average number of passenger per trip and the number of trips per day should be reasonably sufficient to make the service efficient, the service providers face various types of problems e.g. extortion, poor road condition, too much idle time/poor terminal facilities etc. which negatively affect the investors. The efficiency of a transport mode can be judged in tern of various factors, such as speed, safety, adequacy, frequency, regularity, integration, dependability, vehicle operators. The factors are discussed below:

Speed:

Speed reduces overall cost, reduces storage and inventorying, helps a faster around with existing facilities.

Safety:

For the passengers demand highest possible, standards of construction, maintenance and operation. Road transport increasingly becoming unsafe with the spectacular grow one hour of traffic on the roads. The vehicle move on road space,

Which is shared by all the vehicles and hence crossing and overtaking maneuvers are potential hazard. There is little control on driver requirements and vehicle maintenance even trough rules and regulation do exist to ensure safety.

Adequacy:

It's represent capacity of a fleet to carry people and good fundamental requirement for any transport system is the ability to meet the demand.

Frequency:

Frequency is an important characteristics of transportation system. Bus service requires efficiency in capacity and frequency in schedule during the morning and afternoon peak-hours.

Waiting time of the passengers at the stoppage depend on the capacity of service and frequency of trips. Assured frequency attracts passengers.

Regularity:

It is the punctuality of the service and its ability to adhere to published schedules. A regular service inspires confident in the clientele.

Integration:

Integration denotes whether the mode involves transfer from one system to another or involves transaction with a single undertaking or multiple undertakings.

A system with few transfer and operate under single undertaking is the most efficiently integrate system.

Comfort:

Comfort is essential for the passengers transport. Seating arrangement, getting in and out facilities, wide windows etc. determine the comfort.

Cheapness:

It is the main consideration for consumer preference. Cheapness depends on total resources cost, including initial facility construction, cost of maintenance of the facility and the cost of operation. Sometimes monopoly business and lack of competition lead to higher fare.

Dependability:

Refers to on-schedule movement of vehicles carrying passengers and freedom from delays and from joss and damage route. A carrier with a poor record for dependability stands in a difficult competitive position.

The global energy crisis has promoted transport planner to select modes and systems, which is the most fuel-efficient. The lesser the efficiency in burning the fuel, the higher the rate of environmental pollution because of higher emission.

2.4 Terminals:

A terminal is simply the beginning or the end of the service route for a transportation system. A terminal is the operational origin or destination of that traffic, or the point to which it is usually brought from outlying areas for consolidation prior to road movement or for distribution to those outlying point~ following a road haul. The common functions of bus terminals are that they are the origin and destination of traffic service, they provide the space for loading and unloading, provide facilities for interchange of transports, provide facilities for servicing and maintenance of the fleet, and provide garage facilities.

2.5 Bus stoppage:

Kerb-side parking spaces must be provided for buses. If a bus cannot pull up at alay-by inset into the kerb, it will block a lane intended for traffic as it picks up and discharge passengers. Moreover, the lane change will interrupt the flow of other traffic. If buses do not stop frequently at desirable locations, then passengers will be encouraged to use other types of modes, which do not provide' share-riding facilities. As a result, traffic congestion will increase and there will be increases demand for road and parking facilities. Undesirable though it may be from traffic aspect, very many bus stoppages are located not far from intersections, as this is most convenient for passengers. Each stop should have a clearly defined and

marked zone and, where appropriate a layby of sufficient length should be provided to contain all buses that can be reasonably expected to stop at a given time.

Figure 1.2: Bus stoppage

2.6 Operational control:

Operational control is the regulation exercised over vehicles and traffic to attain maximum safety and efficient utilization of the network and other facilities. Control is also exercised to achieve dependability of movement and maximum realization of traffic capacity. Involved here are maximum passenger carriage, maximum permissible speed, scheduling, and the effective use of route capacity Control includes keeping movement records of all the vehicles. It also includes forwarding information for operational and planning purposes regarding movements underway

and contemplated. Means of operational control include rules, and regulation standard operating procedures, use of signs, signals, communications, records and reports.

Some technical terms which are used in the thesis are defined below:

Trip: A one way movement between an origin and a destination, independent of length or distance.

Trip time: time required to complete a trip, i.e. the time elapsed between arrival at the origin for the trip and arrival at the destination after the trip.

Running time: the time vehicle is in motion

Waiting time: the time elapsed between arrival of a bus in a stoppage and departure of the bus from the stoppage.

Delay at signal: Waiting time for red signals at the intersections. Delay due to congestion: waiting time in the congestion. Delay due to other reasons: When the bus is kept static at level crossings, by traffic personnel etc.

Idle time: The time when the bus is not engaged in trips.

Running Speed: The travel length divided by the running time, expressed as kilometer per hour.

Travel Speed: The Travel length divided by trip time or travel time, expressed as kilometer per hour.

Chapter-3
Bus Service in Dhaka City

3.1 Historical background of Dhaka City:

The city of Dhaka ha many ups and downs politically, economically and functionally. It is popularly known that the city was first founded by Islam Khan. But the historical evidence shows that there was a notable city in the vicinity even in pre-Mughal times. Probably, this pre-Mughal town spread from the Dulai Khal upto the present Mitford Hospital. Dhaka first important during Mughal period when Islam Khan was appointed the viceroy of Bengal in 1608, with this capital at a Rajmahal. He decided to move his headquarters farther east and chose a new site on bank of the river Buriganga, now the city is Dhaka.

‘’Islam Khan reconstructed the old Afghan fort on the site of present Central Jail. He did not build a place. He preferred to live on barge. The industrial and commercial prosperity of the city started during the third Viceroy, Ibrahim Khan. Many permanent buildings including the place of viceroy were built on the bank of the river. The most important phase of prosperity in Dhaka in the

latter half of the seventeenth century when Jumal was appointed as viceroy in 1660.Mir Jumal did not add much to the city, but he paved the way for the great developments, which took place under the long and peaceful rule of Shaista Khan from 1663 to 1679. That was the golden age of Dhaka. Industry and trade flourished. The population of the city is said to have reached 900,000 and the built up area extended for 12 miles along the riverbank and 8 miles island.

Table 3.1: Population of Dhaka

Year	Population
1872	69,212
1881	79,076
1911	125,000
1941	239,000
1951	336,000
1961	556,000
1964	1680,000
1981	3,440,000
1991	6,950,920
2001	0,912,908

3.2 Transportation Service in Dhaka City:

Since the time immemorial, water bodies were vastly used in Bangladesh for transportation purpose because of existence of extensive network of water bodies its topographic condition and climate nature. Before the British period, wheeled traffic was very insignificant. In Dhaka, Dholai Khal was the heart of the city for the transportation system. As the city was very small in size, all areas were within normal walking distance for a person. After the partition in 1947, Dhaka became the provincial capital of East Pakistan. Size and population of the city increased rapidly. Thus a faster vehicle, rickshaws was introduced. Through some motorcars were available at that time, they were very few in numbers. Privately owned bus system was introduced in the city in 1950. This was insignificant to meet the demand of the people. Thus the government introduced EPRTC (East Pakistan Road Transport Corporation) in 1961. The combined fleets of EPRTC and private buses were operating in the following routes:

1. Sadarghat- Rampura
2. Gulistan - Banani
3. Gulistan – Mirpur
4. Gulistan-Demra
5. Gulistan-Mohammadpur

Later routes Like Gulisthan- Mohammadpur and Polashi – Rumpura were introduced. The war of Liberation in 1971 caused huge damage to the fleet. After the independence, city size and population grew in an unprecedented speed. Numbers of buses could not keep pace with the increased demand of the increased population. All type vehicles increased very rapidly.

Table 3.2: Number of buses in the city

Year	Number of Buses
1965	98
1970	141
1980	173
2003	2488

Source: Firdus, 1984 and BRTA, 2003

During the last few years Government took several measures to relieve the city of the intolerable traffic congestion. As a part of the scheme, rickshaws were banned from many parts of city road network, old buses and trucks of more than 20 years old and 2-stoke 3- wheelers were also banned and introduced soft taxation system for taxicabs and buses .Initial impact was negative and passenger had to suffer a lot, present situation is little better than previous condition.

3.3 Vehicle in Greater Dhaka:

The transportation modes in Dhaka can be grouped into three categories, i.e:

1. Fast moving motorized vehicles, like cars, buses etc.
2. Slow moving non – motorized vehicles, like rickshaws, pushcarts etc.
3. Intermediate category between the above two extremes, consisting of motorized vehicles and moderate in speed, like scooter, mishuk etc.

Table 3.3 Estimated motorized vehicles in Dhaka

Vehicles Type	1992		1996		Average growth rate(%/year)
	Number	Percentage	Number	Percentage	
Motorcars	12,303	15	23,241	20.6	17
Jeeps	10,178	12.4	12,705	11.2	6
Bus	1,344	1.6	1,460	1.3	2
Minibus	1,740	2.1	2,141	1.9	5
Trucks	1,859	2.3	3,858	3.4	20
3 wheelers	16,8361	20.5	27,443	24.3	13
Bi-cycle	35,835	43.7	40,127	35.5	3
Other	1.922	2.4	1,996	1.8	0
Total	82,086	100	112,971	100	8

Reliable statistics on the size of the vehicle fleet in Dhaka are not available. The vehicle registration authority, BRTA, has records on the number of motorized

vehicles registered in Dhaka each ha no information on the number of vehicle retried each year. DUTP phase-2 Consultants applied a retirement profile for each type of vehicle registered with BRTA and estimated the volume of motorized vehicles. It shows a rapid rate of motorization in Dhaka over the year. Reliable estimates of non-motorized vehicles are difficult to obtain DCC limits number the number of license for rickshaws to 70,000. However, unofficial estimates claim the number of rickshaws plying in Dhaka is several times more than the DCC figure. Dhaka metropolitan Regional Transport Committee has adopted different policies and programs to make the communication within the city easier, smooth and comfortable. Thus it has decided to limit the number of public transportation considering the demand of the passengers.

Table 3.4 Ceiling for transport (without BRTC)

Vehicle	Ceiling	Permitted up to June, 03
Bus ,Minibus	3,090	2,488
Taxi cab	10,000	8,500
Scooter+ Mishuk	10,000+3,000	9,500
Human Haulers	---------	1,700
Total		22,188

3.4 Road Network of the Dhaka City:

Dhaka ha primarily a road based transport system. Most of the roads in the old town are narrow, irregular and are almost unsuitable for motorized vehicles. Most of the areas in new Dhaka have unplanned growth. Primary roads are wide and suitable for fast moving vehicles. It comprises only 6.67% of total road network of the city. Secondary roads are narrow than primary roads, still suitable for motorized vehicles. In some cases secondary roads are suitable for bus service to a limited extent. Feeder roads and other types of roads are not suitable for bus service.

Table 3.5: Road network of the city

Road Type	Length(km)	Percentage of Length Primary
Primary roads	200	6.67
Secondary roads	110	3.66
Feeder roads	152	5.06
Other(minor/access)	2,540	84.6
Total	3,002	100

Source: DTCB, 2003

All the intersections are at grade. Major ones are controlled by manual or electric signals some are rotary type and few have property designed channelization measures. Thus pedestrians are seen crossing the roads haphazardly hindering traffic movement deteriorating the level of service provided by vehicles.

3.5 Overall share of different modes in the city:

DITS conducted surveys on mode of travel and number of trips by different modes. JICA study Team estimated number of person trips and passenger-km in 1999 using DITS data. It was found that the predominant mode was walking with a share of 62%. Of the person trips by mechanized vehicles, rickshaw has the highest share

Table 3.6: Person Trip and passenger-km by mode, 1999

Mode	Number of Person Trip		Average trip length per day(km)	Passenger-kilometer	
	000/day	Percentage		000/day	Percentage
Car	576	10.5	10.4	5,990	11.9
Bus	1,482	27	13.5	20,007	39.8
Auto-rickshaw	845	15.2	12.8	10,816	21.6
Rickshaw	1,927	35	4.3	8,286	16.5
Others	675	12.3	7.5	5,066	100
Sub total	5,505	100	9.1	50,165	100
Vehicular modes	5.505	38	9.1	50,165	85
Walk	9,000	62	1	9,000	15
Total	14,505	100	4.1	59,165	100

Source JICA (2000)

(35%) followed by bus (27%). It terms of passenger-kilometer, of all the motorized vehicles bus dominates (40%) followed by auto-rickshaw (22%).It shows there is high dependence on bus, rickshaw and walking modes within Greater Dhaka area. It is likely to continue in future unless the disposal income of people increase for a shift better service, which is most unlikely. Thus there is a strong case for implementing measures to assist operation of bus services while also providing for safe operation of non-motorized vehicles at least in the foreseeable future.

The study emphasizes importance of buses as the primary means of travel. Buses are performing the task with no special advantages over other modes. Thus DUTP phase-2 Consultancy Final Report considered providing buses, as the means to avoid congestion, higher patronage and further increasing the proportion of transportation by bus.

Table 3.7: Available mass transit facilities foe Dhaka City

Description	Standard bus	Minibus	Taxi	scooter	Rickshaw	Human Hauler
Number of vehicles in the fleet	60	2,424	8,500	9,500	100,000	1,7000
Passenger capacity per vehicle	52 seat+ 15 standing	35 seat+10 standing	3	3	2	15
Passenger capacity of the fleet	4,020	109,080	25,500	28,500	200,000	25,500
Vehicle/100,000 people	0.606	24.5	85.85	95.95	1010	17.17
Seat/1000,000 people	40.6	1101.8	257.57	287.87	2020	257.57

3.6 Present bus service in Dhaka City:

Bus operation system can be divided into two types depending on the ownership of buses i.e., public and private. Government organization, Bangladesh Road Transportation Corporation (BRTC), operates its own buses; while different transport companies or individual owners under the umbrella of different route transport associations run the privately owned buses.

3.6.1 BRTC

It was established in 1961 to meet the growing demand for transportation in Dhaka City. After the banning of buses of more than 20 years old from the streets of the city. BRTC came forward to solve the problem of mass transit shortage. It started to introduce new routes for convenience of passengers. Two types of buses are playing now under BRTC, i.e.

1. Single-decker standard buses

2. Double-decker buses

Table 3.8: Types and number of BRTC routes

Types of routes	Number of routes	Number of buses
Dhaka city Service	26	379
Inter District Service	65	207
Total	91	586

Source: BRTC, 2003

BRTC tries to cover as much part of the city. Moreover, it links the surrounding urban areas with the city. To meet the demand of passengers of different classes, BRTC operates different types of Buses and service in the same route, i.e.

1. Local: In the service fare is cheap.

2. Sitting: pre-ticketing is must for the service.

3. Ladies: This service is only for female passengers.

3.6.2 Privately owned buses:

Private owners introduced bus service in the city after partition of India. Owners were mainly those who came from India. After 1971, they left the country selling those. In many cases new buyers dismantled them and sold as spare parts. There was not enough growth in private sector buses compared to BRTC buses till 1980.

Table 3.9: Number of Buses in the city

	1965	1970	1980	2003
BRTC buses	30	49	74	379
Private buses	68	92	99	2488

Source: Firdous (1984), BRTC (2003), BRTA (2003)

Table 3.10: Number of different types of buses under private sector

Type	Passenger capacity	Number of buses
Standard bus	52	60
Double-decker	90	4
Minibus	32	2424
Total	------	2488

Source: BRTA (2003)

3.6.2.1 Bus Routes:

Now there are 44 routes in the city for the movement of people within the city. Once Gulistan was the one end of all bus service. Now it is dispersed to reduce the congestion in the area and to link different areas with minimum interchange of buses. RTC (Regional Transport Committee) can introduce a new route or owners can apply to RTC for a few new route. For the smooth movement of vehicles and to meet the demand of passenger, RTC has ceiling for number of buses in each route. BRTA does not permit any more bus when the ceiling is reached. Number of routes, route description and ceiling of buses in different routes are given in Appendix-2.

3.7 Comparison among different modes:

Most of the owned by private individuals are minibuses. Main reason is that it is cheaper than other buses and in off peak hour its efficiency is better. As its capacity is less than standard bus and double-decker bus, more number of minibuses is required for meeting the same demand. As the number of vehicle increase, it requires space in the road network creating more congestion.

Table 3.11: PCU values for different types of vehicles in Dhaka City

Vehicles	PCU1
Car or Jeep	1
Tempo/Baby Taxi	0.5
Truck	2
Bus	2.5
Minibus	2
Double-decker bus	3
Bicycle	0.2
Push-cart	4
Motorcycle	0.3
Rickshaws	0.8

Source: PPK Consultants Pty. Ltd. (1994)

Table 3.12: Relative efficiency of road space utilization by different modes.

Mode	Share of person trips (%)	Average occupancy	PCU	% of road space occupied	Index of road space efficiency*	Passenger carrying efficiency
Rickshaw	56.5	1.6	0.8	73.1	-22.71	1
Bus	27.8	33	2	4.3	546.5	8.25
Car	9.1	1.8	1	19.7	-53.81	0.9
Tempo	2.3	9.2	0.6	0.4	475	7.7
Baby Taxi	4.2	2.2	0.5	2.5	68	2.2

Source: Quium, (1995) *A +ve value indicates superiority and – ve value indicates inferiority.

Table 3.13: Space requirements for different modes.

Mode	Hourly capacity per lane	Average speed (km/hr)	Space requirement per person movement (sqm)
Pedestrians	23,500	4.7	0.7
Bicycle	5,400	12	8
Motor Cycle	2,400	12	17.5
Car	1,050	12	40
Bus	7,700	10	4.5

Chapter-4

The study routes

4.1 Selection of Route s for the Study:

Different types of fast and slow moving vehicles are seen in the streets of Dhaka City. Presence of thousands of slow moving rickshaws makes the management of traffic very difficult. Large number of citizens from within the city and suburbia come and return home daily almost at the same time, during peak business and office hours. Although the population and volume of traffic have increased dramatically, the number of streets has not increased in that proportion and is highly inadequate. Even in last 10 years only one mentionable road was constructed; it links Matsa Bhaban intersection and Segunbagicha Road. As a result, even the narrow lanes become crowded with traffic. Lack of respect for traffic and street regulations by citizens also contributes to the problem.

Although streets of Dhaka City are classified into four groups, the author did not find similarly between in the books and characteristics of the streets of the city to classify them. Arterial roads are mainly designed for through traffic. These are fully or partially controlled for not giving access to individual are usually properties or minor roads. Parking, loading and unloading activities are usually restricted or

regulated on such road. In Dhaka City these are rarely practiced. As a result, theoretically proposed smooth movement of vehicles in arterial. Streets is absent in the city. Moreover, presence of fast and slow moving vehicles in the same carriageway deteriorated the situation. It is already mentioned that the city is extending its boundary to the North because of availability of suitable area for urbanization. There are only a few primary roads to join the northern part of the city with the southern part or the center of the city. Mohammadpur to Polahi is route 1 and Rampura – FDC - Rampura route 2. Almost all bus service of Dhaka City use at least one of the roads to complete a trip. The table –B in the Appendix-3 shows the number of bus routes operating in Dhaka city.

4.2 Inventory of the routes:

Route 1:

The buses in route 1 operates the terminal at Mohammadpur to Polashi (fig 4.1).Expending the terminals there are 7 stoppages on the route namely Mohammadpu1, Mohammadpur 2, Shankor, Abahoni, Dhanmondi 15, Ziga tola, City college. The route length 5.1 km. Service starts between 8 AM to 8 PM .Each bus complete 10 trips or single trips in a day.

Route 2:

The buses in route 2 operates the terminals at Rampura FDC – Rampura(figure 4.2)

Expending the terminals, there are 9 stoppages in the route, namely FDC crossing, Gegunbari, Gunshan aarong, Merul badda, Rampura, Mohanagar project, Modhubag, Boubazzar ,police plaza.The route length km. Service Starts between 6AM to 11 PM. Each bus complete 14 trips or single trips.

Table 4.1: Characteristics of route 1 and 2

Parameter	Route1	Route 2
Origin and destination, via	Mohammadpur via Polashi	Rampura-FDC-Rampura
Route length	5.1	8.8
Round trip/bus/day	10	14
Total distance covered bus/day	230	180
Time to complete a single trip	37 min	30 min
Average speed	8.27	16
Number of stoppages	7	9
Average distance between stoppages(km)	1	1.2
Operating period	From 8 AM to 8 PM	From 6 AM to 11 PM

Figure 4.1 Route -1

Figure- 4.2: Route -2

Chapter -5

Performance of Bus Services in the Selected Routes

5.1 Surveys:

Traffic surveys were conducted on all 2 selected routes in order to find out route characteristics, travel pattern and performance of bus service in the routes. In order to study the performance of the buses of the routes, field surveys would depict the existing situation. Mainly two types of surveys were conducted in the routes, namely

1. Travel Time Survey of buses
2. Sample Questionnaire Survey of Passengers

Travel Time includes, running time of the vehicles, waiting time at the stoppages, and delay due to various reasons. Without traveling in the bus, it was quite difficult to collect all these data because these data were not available from any secondary source.

Four selected periods were

1. Morning (between 6:30 a.m. and 10:00 a.m.)
2. Noon (between 11:30 a.m. and 3:00 p.m.)
3. Afternoon (between 3:30 p.m. and 6:30 p.m.)
4. Evening (between 6:00 p.m. and 9:30 p.m.)

Initially reconnaissance surveys were conducted to get a view of the routes so that all the requirements for the detailed surveys could be arranged. At the same time, rush hour and rush-direction at those routes were also observed and surveys were designed in such a way that they can present the worst and the best situation of the routes.

Another survey was conducted after travel time survey. That IS sample questionnaire survey. It was very conducted among the passengers in the buses. Reconnaissance surveys and demo surveys were also carried out for this one to see the reaction of passengers to different questions in the questionnaire. Accordingly some questions were excluded from the questionnaire and some more questions were included. Finally the survey was conducted. Passengers were randomly selected and given a questionnaire to fill in. They were free to answer which were based upon their regular or irregular travel in the route. It was conducted at different parts of the day, and at both directions. Passengers of all class, group and sex were surveyed. In a maximum cases, women refused to respond to the surveyor's request. Target was to survey 50 passengers at each route and in total 200 was surveyed. Some passengers of boarded buses for smaller period of time. Such 50 passengers were given the questionnaire with envelope to return by mail. But no questionnaires were returned. In most cases, passengers completed the questionnaire themselves.

In several cases surveyors had to write down according to the answer of the interviewee. In few cases, surveyors had to face awkward situation. They tried to convince of the passengers and proceeded in the survey.

5.2 Performance study in route 1:

5.2.1 Route description:

Route 1 operates from Mohammadpur to Polashi. According to BRTA the route was designed from Mohammadpur-1, Mohammadpur-2, Shankar, Dhanmondi 15, Abahani Play Ground, Jigatola, City College, Dhaka College, New Market, Azimpur, Polashi. There are 11 stoppages in the route. The route length is 5.1 km. Service starts from 8 AM to 8 PM .Each bus can complete 10 trips within 12 hours every day. On an average, each single trip takes about one hour and a quarter.

5.2.2 Trip time:

The study was conducted at different periods of the day to find out the condition at different situation of the day. It was conducted at both directions. For the convenience of the author, the direction from Polashi to Mohammadpur was considered DOWN and Mohammadpur to Polashi was considered UP. While going from Mohammadpur to Polashi, required time to complete a trip varied widely. From the study it was found that the maximum time required to complete a single

trip was 1 hour and 15 minute and the minimum time required to complete the trip was 54 minutes, both in UP direction (Table 5.1) while in opposite direction (DOWN journey), travel time was fairly same. In case of UP journey, lowest time was found at afternoon, because, drivers knew that they would make a good business if they could return to Polashi and started a trip at evening. For the same reason, DOWN time was found lowest at evening to reach Mohammadpur early and to get back the passengers to their residences. The total average trip time (average for UPDOWN journey) was found to be 1 hour and 6 minutes.

Table 5.1: Time to complete a trip in hour: minute (Route 1)

Origin destination	Average time	Maximum time	Minimum time
Mohammadpur to Polashi	35	43	32
Polashi to Mohammadpur	37	47	36

Source: Modified from Table I in Appendix- 4

5.2.3 Running time:

Running time between two consecutive stoppages varied according to the road condition and the distance between the two stoppages. In some cases variation was high (Table 5.2). Reasons were frequent illegal stoppages to get passengers, congestion in the road and unfair competition among buses that caused blockage in

free movement of vehicles. As the number of illegal stoppages increased, the running time also increased due to reduced speed of the vehicles.

Table 5.2: Running time between different stoppages in minute (Route 1)

Stoppage	Time for UP journey			Time for DOWN journey		
	Average	Maximum	Minimum	Average	Maximum	Minimum
Mdpur 1- Mdpur 2	7	4	11	2	3	1
Mdpur 2- Shankar	9	12	6	3	4	2
Shankar- Dhanmondi 15	3	4	2	3	4	2
Dhanmondi 15- Abahani Play Ground	3	4	2	3	4	2
Abahani Play Ground- Jigatola	3	4	3	4	6	3
Jigatola- City College	4	5	3	4	5	3
City College- Dhaka College	3	4	3	8	12	4
Dhaka College- New Market	2	3	1	4	5	2
New Market- Azimpur	9	11	7	15	18	12
Azimpur- Polashi	3	4	2	20	27	14
Total Running Time	46	55	40	66	88	45

Note:

1. The average maximum and minimum running times among four different trips at morning, noon, afternoon and evening between individual stoppages have been shown in respective column in the table.
2. The maximum and minimum of the total running time among four different trips at morning, noon, afternoon and evening are shown at the bottom of the respective columns But, this is not the summation of maximum or minimum running time shown in the column
3. Source: Modified from tables 2 and 3 in appendix 4

5.2.4 Waiting time:

Waiting time of buses at stoppages varied significantly according to the probability of getting passengers in the stoppage, loading condition of the passengers in the bus, headway with the next and previous buses. In the first half of the route, generally, buses stay longer time in the stoppages.. Traffic Sergeants play a significant role in determining the waiting time of a bus at any stoppage. Drivers always reduce, as much as possible, the waiting time at any stoppage, if traffic Sergeant is present there.

Table 5.3: Waiting time at different stoppages in minute (Route 1)

Stoppage	Time for UP journey			Time for DOWN journey		
	Average	Maximum	Minimum	Average	Maximum	Minimum
Mohammadpur-1	8	10	6	0	0	0
Mohammadpur-2	3	4	2	3	2	4
Shankar	1	2	1	1	1	1
Dhanmondi 15	2	3	2	2	1	2
Abahani Play Ground	2	3	1	1	1	2
Jigatola	3	4	2	1	1	1
City College	1	1	1	1	1	1
Dhaka College	1	1	1	1	1	2
New Market	1	1	1	2	1	2
Azimpur	1	1	1	15	10	20
Polashi	1	1	1	1	1	1
Total Waiting Time	24	32	19	28	20	36

Note:

1. The average maximum and minimum running times among four different trips at morning, noon, afternoon and evening between individual stoppages have been shown in respective column in the table.
2. The maximum and minimum of the total running time among four different trips at morning, noon, afternoon and evening are shown at the bottom of the respective columns But, this is not the summation of maximum or minimum running time shown in the column
3. Source: Modified from tables 4 and 5 in appendix 4

Waiting time also varied significantly according to the direction and period of the day. In the early morning, waiting time was generally high towards UP journey, when the road was almost free, but availability of passengers was low. In the morning, towards CBD and in the evening in reverse direction, waiting time was considerably low because of availability of passengers. Whereas at noon, waiting time was high at any direction. Some exceptions were found in each case (Table 5.3). On an average, total stoppages time of buses at the stoppages is about 29% of the total trip time for a single trip in this route. From the table 5.3 it is also found that the maximum waiting time at a single stoppage was 10 minutes and the minimum waiting time was 1 minutes .

5.2.5 Delay due to signal:

Loss of time due to signal was massively found in the section between City college and Mohammadpur in both directions. While towards CBD, the situation was severe in the morning and at noon; and the worst situation was generally found at City College and new market intersections. Whereas in the reverse direction, the situation was the worst in the evening and such condition was found at Dhaka College and Azimpur intersection (Table 5.4)

Table 5.4: Delay due to signal between stoppages in minute (Route 1)

Stoppage	Time for UP journey			Time for DOWN journey		
	Average	Maximum	Minimum	Average	Maximum	Minimum
Mdpur 1- Mdpur 2	3	4	2	2	3	1
Mdpur 2- Shankar	0	0	0	0	0	0
Shankar- Dhanmondi 15	0	0	0	0	0	0
Dhanmondi 15- Abahani Play Ground	3	4	2	0	0	0
Abahani Play Ground- Jigatola	3	4	2	0	0	0
Jigatola- City College	0	0	0	0	0	0
City College- Dhaka College	2	3	1	4	4	2
Dhaka College- New Market	0	0	0	0	0	0
New Market- Azimpur	0	0	0	7	8	6
Azimpur- Polashi	4	5	3	0	0	0
Total Signale Time	15	19	10	13	15	9

Note:

1. The average maximum and minimum running times among four different trips at morning, noon, afternoon and evening between individual stoppages have been shown in respective column in the table.
2. The maximum and minimum of the total running time among four different trips at morning, noon, afternoon and evening are shown at the bottom of the respective columns But, this is not the summation of maximum or minimum running time shown in the column
3. Source: Modified from tables 6 and 7 in appendix 4

As a result vehicles from other two directions faced huge delay there. Moreover, buses in UP journey faced severe problem, as they had to face a huge delay at the intersection in front of PG. The intersection was not kept open enough time for the vehicles moving towards Jigatola. As the section between new market and azimpur intersections fail to accommodate huge number of vehicles in the direction, passengers are bound to stay there for an unexpected longer period. Jigatola intersection was a hell for DOWN going vehicles. The buses had to face huge loss of time at the intersection at maximum part of the day. For the DOWN going vehicles, another disgusting intersection was City college intersection. Buses were bound to wait in long queue at the intersection especially at peak periods. On an

average total delay due to signal (15 minutes) of the buses at intersection was about 20% of the total trip time for a single trip in the route.

5.2.6 Trip time components:

From table 5.6, it is found that the average total trip time for buses in the route was about for a route length of 5.1 km. The maximum trip time was 47 minutes and the minimum trip time was 43 minutes (both in UP journey). Average running time of bus was 35 minutes, which was about 44% of average total trip time. The total average waiting time of the buses at the stoppages was about 19 minutes, which was about 29% of average total trip time. The delay for congestion in the route was not much, which, on an average was only 2 minutes and 18 seconds. But there was much delay at signals, which on an average was 13 minutes and 4 seconds (20% of total average trip time). The delay at the illegal stoppages was also considerable, which was about 3 minutes (about 5% of total average trip time). From the study, it was found that running time, waiting time and delay at the intersections are the three main constituents of travel time.

Table 5.5: Component of trip time (min: sec) in a trip (Route)

Components	UP journey			DOWN journey			Average of Up And Down journey
	Ave	Max	Min	Ave	Max	Min	
Running time	46	55	40	66	88	45	56
Waiting time	24	32	19	28	20	36	26
Delay for signal	15	19	10	13	15	9	14
Total time in Hr: min	1:25	1:46	1:09	1:47	2:03	1:30	1:36
Distance in km	5.1	5.1	5.1	5.1	5.1	5.1	5.1

Note:

1. The average, maximum and minimum of different components of four different trips at morning, noon, afternoon and evening are shown in respective column in the table.
2. The maximum and minimum of the total trip time among 4 different trips at morning, noon, afternoon and evening are shown at the middle of the respective columns. But, this is not the summation of maximum or minimum of different components of tripe time shown in the above part of the respective column.
3. Source: Modified from tables 10 and II in appendix 4

5.3 Performance study in route 2:

5.3.1 Route description:

Route 2 operates from FDC crossing to FDC crossing According to BRTA the route was designed from Begunbari, Gulshan aarong, Police plaza, Merul badda, Rampura, Rampura , Mohanagar project , Modhubag , Boubazaar , FDC crossing .There are 11 stoppages in the route. The route length is 8.8 km. Service starts from 6 AM to 11 PM. Each bus can complete 7 trips within 17 hours every day. On an average, each single trip takes about one hour and a quarter.

5.3.2 Trip time:

The study was conducted at different periods of the day to find out the condition at different situation of the day. It was conducted at both directions. For the convenience of the author, the direction from FDC crossing to FDC crossing was considered DOWN and FDC crossing to FDC crossing was considered UP. While going from FDC crossing to FDC crossing, required time to complete a trip varied widely.

Table 5.6: Time to complete a trip in hour: minute (Route 1)

Origin destination	Average time	Maximum time	Minimum time
FDC crossing to FDC crossing(u)	48	60	36

Source: Modified from Table I in Appendix- 4

5.3.3 Running time:

Running time between two consecutive stoppages varied according to the road condition and the distance between the two stoppages. In some cases variation was high (Table 5.2). Reasons were frequent illegal stoppages to get passengers, congestion in the road and unfair competition among buses that caused blockage in free movement of vehicles. As the number of illegal stoppages increased, the running time also increased due to reduced speed of the vehicles.

Table 5.7: Running time between different stoppages in minute (Route 1)

Stoppage	Time for UP journey		
	Average	Maximum	Minimum
FDC crossing - Begunbari	7	4	11
Begunbari - Gulshan aarong	9	12	6
Gulshan aarong - Police plaza	3	4	2
Police plaza - Merul badda	3	4	2
Merul badda - Rampura	3	4	3
Rampura - Rampura	4	5	3
Rampura - Mohanagar project	3	4	3
Mohanagar project - Modhubag	2	3	1
Modhubag - Boubazaar	9	11	7
Boubazaar - FDC crossing	3	4	2
Total Running Time	46	55	40

Note:

4. The average maximum and minimum running times among four different trips at morning, noon, afternoon and evening between individual stoppages have been shown in respective column in the table.
5. The maximum and minimum of the total running time among four different trips at morning, noon, afternoon and evening are shown at the bottom of the respective

5.3.4 Waiting time:

Waiting time of buses at stoppages varied significantly according to the probability of getting passengers in the stoppage, loading condition of the passengers in the bus, headway with the next and previous buses. In the first half of the route, generally, buses stay longer time in the stoppages.. Traffic Sergeants play a significant role in determining the waiting time of a bus at any stoppage. Drivers always reduce, as much as possible, the waiting time at any stoppage, if traffic Sergeant is present there.

Table 5.8: Waiting time at different stoppages in minute (Route 1)

Stoppage	Time for UP journey		
	Average	Maximum	Minimum
FDC crossing - Begunbari	2	3	1
Begunbari - Gulshan aarong	2	2	1
Gulshan aarong - Police plaza	2	3	1
Police plaza - Merul badda	3	4	2
Merul badda - Rampura	3	4	2
Rampura - Rampura	1	2	1
Rampura - Mohanagar project	2	3	1
Mohanagar project - Modhubag	2	2	2
Modhubag - Boubazaar	2	2	1
Boubazaar - FDC crossing	3	4	2
Total Waiting Time	22	29	14

Note:

4. The average maximum and minimum running times among four different trips at morning, noon, afternoon and evening between individual stoppages have been shown in respective column in the table.
5. The maximum and minimum of the total running time among four different trips at morning, noon, afternoon and evening are shown at the bottom of the respective columns But, this is not the summation of maximum or minimum running time shown in the column

Waiting time also varied significantly according to the direction and period of the day. In the early morning, waiting time was generally high towards UP journey, when the road was almost free, but availability of passengers was low. In the morning, towards CBD and in the evening in reverse direction, waiting time was considerably low because of availability of passengers.

5.3.5 Delay due to signal:

Loss of time due to signal was massively found in the section between City college and Mdpur in both directions. While towards CBD, the situation was severe in the morning and at noon; and the worst situation was generally found at City College and new market intersections. Whereas in the reverse direction, the situation was

the worst in the evening and such condition was found at Dhaka College and Azimpur intersection (Table 5.4).

Table 5.9: Delay due to signal between stoppages in minute (Route 1)

Stoppage	Time for UP journey		
	Average	Maximum	Minimum
FDC crossing - Begunbari	0	0	0
Begunbari - Gulshan aarong	2	2	1
Gulshan aarong - Police plaza	1	2	1
Police plaza - Merul badda	0	0	0
Merul badda - Rampura	3	4	2
Rampura - Rampura	0	0	0
Rampura - Mohanagar project	0	0	0
Mohanagar project - Modhubag	2	2	1
Modhubag - Boubazaar	1	2	1
Boubazaar - FDC crossing	3	4	2
Total Signal Time	12	16	8

Note:

4. The average maximum and minimum running times among four different trips at morning, noon, afternoon and evening between individual stoppages have been shown in respective column in the table.
5. The maximum and minimum of the total running time among four different trips at morning, noon, afternoon and evening are shown at the bottom of the respective columns But, this is not the summation of maximum or minimum running time shown in the column
6. Source: Modified from tables 6 and 7 in appendix 4

As a result vehicles from other two directions faced huge delay there. Moreover, buses in UP journey faced severe problem, as they had to face a huge delay at the intersection in front of PG. The intersection was not kept open enough time for the vehicles moving towards Jigatola. As the section between new market and azimpur intersections fail to accommodate huge number of vehicles in the direction, passengers are bound to stay there for an unexpected longer period. Jigatola intersection was a hell for DOWN going vehicles.

5.3.6 Trip time components:

From table 5.6, it is found that the average total trip time for buses in the route was about for a route length of 5.1 km. The maximum trip time was 47 minutes and the

minimum trip time was 43 minutes (both in UP journey). Average running time of bus was 35 minutes, which was about 44% of average total trip time. The total average waiting time of the buses at the stoppages was about 19 minutes, which was about 29% of average total trip time. The delay for congestion in the route was not much, which, on an average was only 2 minutes. But there was much delay at signals, which on an average was 13 minutes and 4 seconds (20% of total average trip time). The delay at the illegal stoppages was also considerable, which was about 3 minutes (about 5% of total average trip time). From the study, it was found that running time, waiting time and delay at the intersections are the three main constituents of travel time. Although, buses stop frequently to get the passengers, the total time for illegal stoppages is not significant considering the loss of time at intersections. In some cases, running time is about 50% of trip time. In maximum cases running time is around 40% of trip time. Moreover, travel speed is less than 50% of running speed in many cases.

Table 5.10: Component of trip time (minute) in a trip (Route 2)

Components	UP journey		
	Ave	Max	Min
Running time	46	55	40
Waiting time	22	29	14
Delay for signal	12	16	8
Total time in Hr : min	1:20	1:40	1:02
Distance in km	8.8	8.8	8.8

Note:

4. The average, maximum and minimum of different components of four different trips at morning, noon, afternoon and evening are shown in respective column in the table.
5. The maximum and minimum of the total trip time among 4 different trips at morning, noon, afternoon and evening are shown at the middle of the respective columns. But, this is not the summation of maximum or minimum of different components of tripe time shown in the above part of the respective column.

5.4 Comparative performance of bus services in the routes:

Before we start analyzing and comparing bus services of different routes, we rather discuss some standards mentioned in the DUTP Phase 2 Consultancy for bus services in Dhaka City.

Table 5:11: Bus service standards for Dhaka City

Suggested Standards Criteria	To be adopted at the inauguration of the developed bus service in Dhaka	To be expected at the completion of full network of developed bus service in the city
Difference between two stoppages	400m	400m
Maximum waiting time for a bus	10 Minutes	4 Minutes
Timetable and frequency	Required and it will be displayed at termini and en-route stops	Same
Minimum percentage of passengers to be seated on a peak hour journey	70%	80%
Minimum travel speed	22km\h	20k\h
Facility at terminal and stoppages	Shear wall be provided	Same
Duration of operation	8an-8pm	6am-11pm

From table 5.11, it is found that, DUTP Phase 2 Consultancy (Vol. 3) suggested some standards for bus services in Dhaka City. The standards to be expected at the completion of full network of developed bus service in the city are following:

1. The distance between two consecutive stoppages would be 400 meter
2. The maximum waiting time of a bus in a trip would be 10 minutes,
3. The minimum travel speed of the buses would be 20 km/hr,
4. Timetable and frequency of the service would be displayed at termini and en route stoppages
5. Minimum percentage of passengers to be seated on a peak hour journey would be 80% and
6. The duration of operation of services would continue between 6:00 AM to 11:00 PM

5.4.1 Average number of passengers carried per trip by buses:

. It is obvious that the number of passenger boarding in the buses would depend on the route length and the number of stoppages they touch. Accordingly it is found that the average number of passenger boarding in the buses were 92 in route 1, 93 in route 1, 140 in route 2,

5.4.2 Volume of passenger service by bus in the study routes:

The average number of passenger-kilometer per bus trip, average trip length per passengers (in km) and the total average number of passenger km per day per bus. It is obvious that the passenger km per bus trip depends on the route length (km) and the average number of passenger per trip. So from the table it is found that the route 1 had the largest number of passenger/km-km per trip (611) since it had the Longest route length (5.1km), while the route 2 had the smallest number of passenger per trip (386) since it had the smallest route length (8.8 km).

The performance of buses in terms of passenger km per day per bus depends on the number of trips completed by each bus in a day for certain length of the trip. In this regard, the performance of route 1 was highest (5920 passenger-k In per day per bus) as because the buses in this route could complete 2 single trips per day in a route length of 8.8 km (the length is second largest). Route 2 shows poorest performance with smallest number (3860) of passenger-km per day per bus. It happened as the route length was shorter but the buses could not complete higher number of trips.

5.4.3 Time components of buses in the study routes:

Route 1 shows best performance with average speed of 13.4 km/hr. In case of running speed, routes 1, 2 and II show good performance.

In all the routes, the running time was found to be less than 50% of total trip time. All the routes showed very high waiting time at stoppages. Of these, route 11 showed best performance with lower waiting time, which was 20% of the total trip time; waiting time was maximum (29% of the trip time) in route I. In case of touching illegal stoppages, route 2 showed poorest performance. In this regard, all routes showed same tendency of touching illegal stoppages. The waiting time at the stoppages and delay due to illegal stoppages combinedly constituted about 34% of trip time in route 1.35% in route 2, 30% in route 9, 26% in route 10 and 23% in route II. Congestion heavily affected route 10; route II is also affected by congestion. Routes 9 and II are badly affected by signals, huge time was lost at signals in the routes. Total time loss due to congestion and signals were found to be 20% in route I, 24% in route 2, 25% in route 9, 39% in route 10 and 32% in route 11.

It was found from the study that huge time was lost in the journey by the buses due to delay at stoppages and congestion at signals. Savings of time in each trip can make the way for additional trip by the buses. Then the same number of trips can

be operated with fewer numbers of buses. This will definitely reduce congestion in the street. Buses were seen waiting at the stoppages without any rules and regulations. Waiting time at stoppages was found to be a maximum of more than 7 minutes and the minimum only 5 seconds. This type of tendencies for waiting must be avoided. As a general principle, buses must not wait for passengers rather passengers should wait for buses. The waiting time of passengers must be suitable enough for the passengers to make the service efficient and comfortable. From the study it was found that the minimum waiting time at a stoppage should not be less than 1 minutes when loading and unloading of passengers are less and the maximum waiting time should not be more than 2 minutes where loading and unloading of passengers are more. Average waiting time of 1 seconds at the stoppages should be sufficient for comfortable loading and unloading of passengers. At terminals waiting time should be 1 minute at peak hours and 3 minutes in off-peak hours; on an average, waiting time at the terminals could be 2 minutes. Illegal stoppages must be avoided. This measures will save huge man-hour every day.

5.5 Opinion of the passengers regarding bus services in the study routes:

5.5.1 Classification of respondents:

A questionnaire survey was conducted among bus passengers to know their views regarding bus service. During the survey the author tried to include people of all sex and age group. As there is no specific data found on the percentage of passengers of different age group and sex using bus services of Dhaka City, so the author had to select passengers randomly for the survey. As people of the country are conservative it was difficult to take the interview of the females. Many of the female passengers refused to respond. Still in the routes, the author could interview a good number of female passengers. In case of age group, the author tried to include passengers of each age group. As most of the passengers using buses are adult, so most of the interviewees were of adult group. From the table below it can be seen that in the study, there were 83% male and 17% female respondents, and also there were 12% children, 82% adult and 6% old respondents.

5.5.2 Comfort in the bus:

It was found in the study that about 80% of the passengers were using the routes for more than 2 years, and about 25% were using for more than 5 years .So any idea, perception, information and guideline provided by them must be good enough for the study and analysis. It was found that about 35% passengers got seat for more than 75% of the trip time and about 70% passengers get seat for more than 50% of trip time. During the peak hours, it became difficult to get seat by all passengers. Only a small number of passenger (4%) never get seat. It also found that more than 80% of the passengers were not happy over the present level of congestion in the buses. They want more comfort in the buses.

5.5.3 Travel time and frequency

About 57% of the respondents had their trip time more than 30 minutes and only 12% of the respondents had trip time less than 15 minutes. From the study it was also found that about 59% of the passengers considered the travel time too much. Only 33% passengers considered the travel time satisfactory. About 46% passengers had to wait for more than 5 minutes to get a bus. More than 50% passengers get a bus within 5 minutes. In fact poor situation arises during peak period. Because of congestion in the road, buses failed to reach the stoppages in time and ultimately, passengers were bound to wait for longer period. About 44%

passengers are satisfied with the present frequency of buses, whereas about 48% are not satisfied with the present frequency.

5.5.4 Use of alternate vehicles

Studies showed that, a large number of passengers occasionally used other types of vehicles as an alternative mode of transport. About 31% passengers used Tempo/Maxi as alternate vehicle of bus. 18% uses CNG and 16% uses rickshaws. In fact socio economic condition and situation determines the alternate vehicles to be used. About 38% passengers use alternate vehicles to save time, about 28% use for comfort. About 17% of the respondents did not mention any alternate vehicles and reason of using the vehicles. Almost all of them do not use any vehicles as alternate and most of them cannot afford an alternate vehicle.

It is seen that in alternate vehicles, only 10% trips take more than 30 minutes whereas it is 58% for bus trips and 10% passengers have to wait for more than 10 minutes to get alternate vehicles whereas it is 46% for the passengers waiting for buses. It is also revealed from the study about 60% of the passengers were willing to pay increased fare for better bus service and about 40% passengers wanted that the fare should not be increased.

Chapter-6

Analysis and Discussion

Objectives of the thesis are to study the performance of existing bus services of Dhaka City and to identity the problems and to recommend some guidelines for Improvement. This chapter summarizes major findings of the earlier chapters and on the basis of those findings some recommendations are made.

6.1 Summary of findings

Throughout the world, mass transit modes carry major part of urban travel trips every day. In most cases, buses are predominant over other modes. Mass transit reduces huge number of other modal trips. Public transport functions within a framework of limited government regulation designed to stimulate the provision of cost effective, efficient and safe services. Local authorities or route associations regulate services and apply fines when buses run below standard or behind schedule.

Considering PCU, average occupancy, amount of used road space, passenger carrying efficiency, space requirement per person movement we can identity the superiority of buses over other modes. Performance of bus service is judged on the

basis of travel speed, frequency, adequacy, safety, regularity, comfort, cheapness, dependability etc. The author studied total travel time, travel speed, running time, waiting time, time lost in the trips, terminal condition and stoppage condition to determine the level of bus service in Dhaka City .The inadequacy of street space and the presence of a variety of motorized and non-motorized vehicles caused great difficulty in managing the transportation system of Dhaka City.

6.2 Problems of bus service and recommendations

From the study it was found that the average travel speed of the buses in different routes ranged between 9.1 km/hr and 13.4 km/hr, which is very low compared to DUTP recommended speed (24km1hr). The running time of bus in all the routes is less than 50% of total trip time and time loss due to delay at stoppages, at congestion and signal and for other reasons constitute more than 50% of total trip time.

The frequency of bus service was not regular and there was no fixed time schedule for the journey in any of the routes. The owners' association blamed that they could not maintain a regular time table for the buses due to delays caused by heavy traffic jam on the roads and also long signaling time at some intersections. The total time loss due to congestion and signal varied between 20% and 39% of trip time in different routes.

In most cases, the cause of traffic congestion was due to large number of standing traffic (rickshaws and cars) occupying road space in front of roadside commercial development, and thereby reducing effective width of road for traffic flow. In big cities a system of major thoroughfares or arterial roads are of prime importance to channelize longer trips from one part of the city to another and beyond. The networks need to be designed for swift and efficient movement of traffic. The most basic and fundamental principle of planning major thoroughfares and arterial roads is that they cannot be used for giving access to individual building or property. If this fundamental principle of planning is not followed, the function of major thoroughfare will be totally destroyed. In Dhaka it can be found that there are lines of shops and commercial activities by the sides of major thoroughfares, especially at the major intersections generating huge number of standing traffic on the roads for on loading and off-loading of passengers and goods. Due to such unscrupulous activities by the sides of major thoroughfare, many of our roads and intersections have become the areas of permanent traffic congestion. There is still scope of improvement through the method of comprehensive re planning and re-designing in some areas of Dhaka City.

The total average waiting time of the buses at the stoppages ranges from 23% to 35% of total trip time and this range of waiting time is very high compared to the

range of waiting time in developed countries. It was observed that the buses waited for long in some important stoppages to get passengers. It was found that the maximum waiting time of a bus at a stoppage is more than 7 minutes, which is unnecessary and undesirable. Again it was found that minimum waiting time of a bus at a stoppage is only 5 seconds. Sometimes the conductors push out the passengers from the bus while it is still in running condition and sometimes pick up passengers in running condition. This is very dangerous for the safety of the passengers and sometimes causes accident.

From the study it was observed that the maximum waiting time of a bus at a stoppage should not be more than 40 seconds and minimum waiting time should not be less than 20 seconds, so that the average waiting time of 30 seconds at the stoppages is enough for on loading and off-loading of passengers safely. As a general principle, buses should not wait for passengers; rather passengers should wait for buses at the stoppages. From the study it was found that if the buses maintain the average waiting time of 30 seconds at the stoppages, it is possible to reduce the trip time considerably in all the routes and increase the number of trips per bus per day. Hence, for carrying same number of passengers per day, less number of buses would be required.

In many cases, it was found that crews were also responsible for lower percentage of running time and higher percentage of delay time. They intentionally get themselves in red signal to wait some more time at intersections to get some passengers. This practice also creates congestion at the intersections.

There is no proper terminal facility for buses in any of the routes. A terminal is the operational origin or destination of traffic service. The terminals need to provide space for loading and unloading, provide garage facilities, and provide facilities for servicing and maintenance of the fleet. At the end of the service period, the fleets of the buses need to have enough space for parking of the vehicles and crewmembers of the buses need to have appropriate facilities for rest, sleep, recreation and refreshment. In the study routes, it was found that the terminals were on the roads. There were no sheds for the passengers to take shelter from the adverse condition of weather. No garage facility and no facilities for servicing and maintenance of vehicles were found. During idle period, the vehicles remain parked on the roads at the terminal. For crew members of the vehicles, there were no facilities for rest, sleep, recreation and refreshment after the end of the day's work. Proper terminal facilities should be developed with the initiative of the public authority and with the contribution from owners and operators.

6.3 Conclusion

Traffic and transportation is a very vast and complex subject. Transportation system plays an important role in smooth functioning of a city. There are various aspects, which determine the efficiency of transportation system of a city. Mass transit is undoubtedly an important component of urban transportation system, especially in big cities. In the cities of developing countries, bus transportation share the major part of the mass transit system. This research study was limited to the aspects of bus transportation system in Dhaka City. The particular objective of the study was to investigate the performance of service in some selected routes of Dhaka City. The study mainly concentrated on performance of service in terms of travel time, travel speed, delays due to waiting, congestion, traffic signal etc. number of trips per day, distance traveled per day, number of passengers carried per bus etc.

The study was not a complete and conclusive one, as there were many more aspects, which could not be studied because of time and monetary constraints. For example, the study did not investigate why the minibuses are dominant and the standard buses (52 seat) are very few in the city routes. The study of economic and financial aspects of bus service is also an important aspect, which was not investigated in

this research. If, in future, more studies are conducted on these aspects, it would be possible to highlight the condition of bus service more vividly and to suggest the possible recommendation more accurately and appropriately.

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6.1, 6.2 and 6.3 have collected from a thesis note book which name is “A STUDY OF THE PERFORMANCE OF BUS TRANSPORT SERVICES IN SOME SELECTED ROUTES OF DHAKA CITY” . Sufian Ahmed had completed it.

Appendix-1

Data Table for Trip Study

Data of Circular Bus Trip-(1-17)

Trip No	Name of the Stoppages	Time of Departure	Time of Arrival	Boarding	Alighting	On Board Female pax
1	FDC crossing	7:40	0	18	0	1
	Begunbari	7:43	7:42	3	0	1
	Gulshan aarong	7:45	7:45	2	0	1
	Police plaza	7:47	7:46	5	5	2
	Merul badda	7:49	7:49	4	0	2
	Rampura		7:52	0	21	0
	Rampura	7:52	7:52	25	0	3
	Mohanagar project	7:54	7:54	1	0	3
	Modhubag	7:57	7:56	1	0	3
	Boubazaar	7:58	7:58	0	4	1
	FDC crossing		7:59	0	23	0

Trip No	Name of the Stoppages	Time of Departure	Time of Arrival	Boarding	Alighting	On Board Female pax
2	FDC crossing	8:00		21	0	2
	Begunbari	8:05	8:02	2	1	2
	Gulshan aarong	8:07	8:06	7	0	2
	Police plaza	8:08	8:08	10	5	2
	Merul badda	8:11	8:10	2	4	0
	Rampura		8:12	0	32	0
	Rampura	8:12	8:12	31	0	2
	Mohanagar project	8:15	8:14	1	0	2
	Modhubag	8:17	8:17	0	0	2
	Boubazaar	8:18	8:18	0	6	2
	FDC crossing		8:19	0	26	0

Trip No	Name of the Stoppages	Time of Departure	Time of Arrival	Boarding	Alighting	On Board Female pax
3	FDC crossing	8:20		28	0	2
	Begunbari	8:24	8:22	3	0	2
	Gulshan aarong	8:25	8:25	0	0	2
	Police plaza	8:27	8:26	2	5	1
	Merul badda	8:30	8:29	4	0	0
	Rampura		8:31	0	32	0
	Rampura	8:31	8:31	25	0	0
	Mohanagar project	8:35	8:34	7	0	1
	Modhubag	8:38	8:37	3	0	2
	Boubazaar	8:40	8:40	0	7	2
	FDC crossing		8:41	0	28	0

Trip No	Name of the Stoppages	Time of Departure	Time of Arrival	Boarding	Alighting	On Board Female pax
4	FDC crossing	9:05		20	0	0
	Begunbari	9:08	9:07	5	0	2
	Gulshan aarong	9:10	9:10	8	0	2
	Police plaza	9:12	9:11	3	3	2
	Merul badda	9:13	9:13	4	10	1
	Rampura		9:16	0	27	0
	Rampura	9:17	9:16	16	0	3
	Mohanagar project	9:19	9:19	9	0	3
	Modhubag	9:22	9:21	6	3	2
	Boubazaar	9:23	9:23	0	0	4
	FDC crossing		9:24	0	28	0

Trip No	Name of the Stoppages	Time of Departure	Time of Arrival	Boarding	Alighting	On Board Female pax
5	FDC crossing	9:26		17	0	2
	Begunbari	9:29	9:28	5	0	2
	Gulshan aarong	9:32	9:31	7	0	2
	Police plaza	9:33	9:33	4	5	2
	Merul badda	9:35	9:34	5	0	1
	Rampura		9:37	0	33	0
	Rampura	9:39	9:37	29	0	4
	Mohanagar project	9:42	9:41	2	0	4
	Modhubag	9:45	9:44	5	8	3
	Boubazaar	9:47	9:46	0	0	3
	FDC crossing		9:48	0	28	0

Trip No	Name of the Stoppages	Time of Departure	Time of Arrival	Boarding	Alighting	On Board Female pax
6	FDC crossing	10:01		21	0	0
	Begunbari	10:04	10:03	3	0	2
	Gulshan aarong	10:07	10:06	1	0	2
	Police plaza	10:08	10:08	7	0	1
	Merul badda	10:10	10:10	2	0	1
	Rampura		10:11	0	34	0
	Rampura	10:12	10:11	29	0	2
	Mohanagar project	10:15	10:15	0	0	2
	Modhubag	10:19	10:18	2	0	2
	Boubazaar	10:21	10:20	0	6	2
	FDC crossing		10:22	0	25	0

Trip No	Name of the Stoppages	Time of Departure	Time of Arrival	Boarding	Alighting	On Board Female pax
7	FDC crossing	10:25		30	0	3
	Begunbari	10:27	10:27	0	0	3
	Gulshan aarong	10:29	10:29	4	7	3
	Police plaza	10:30	10:30	1	0	3
	Merul badda	10:32	10:31	3	0	1
	Rampura		10:33	0	31	0
	Rampura	10:33	10:33	18	0	1
	Mohanagar project	10:36	10:36	5	0	1
	Modhubag	10:39	10:38	8	0	1
	Boubazaar	10:41	10:40	0	4	1
	FDC crossing		10:42	0	27	0

Trip No	Name of the Stoppages	Time of Departure	Boarding	Alighting	On Board Female pax
8	FDC crossing	11:20	21	0	1
	Begunbari	11:22	1	0	1
	Gulshan aarong	11:25	2	0	1
	Police plaza	11:27	0	2	1
	Merul badda	11:29	2	7	1
	Rampura		0	17	0
	Rampura	11:31	16	0	0
	Mohanagar project	11:35	3	0	0
	Modhubag	11:39	1	0	0
	Boubazaar	11:40	0	1	0
	FDC crossing		0	19	0

Trip No	Name of the Stoppages	Time of Departure	Time of Arrival	Boarding	Alighting	On Board Female pax
9	FDC crossing	11:42		23	0	0
	Begunbari	11:45	11:44	2	0	1
	Gulshan aarong	11:47	11:46	7	0	2
	Police plaza	11:49	11:48	1	3	1
	Merul badda	11:51	11:51	0	0	0
	Rampura		11:52	0	30	0
	Rampura	11:53	11:52	18	0	2
	Mohanagar project	11:56	11:55	6	0	2
	Modhubag	11:58	11:58	0	0	2
	Boubazaar	12:00	11:59	0	6	0
	FDC crossing		12:01	0	18	0

Trip No	Name of the Stoppages	Time of Departure	Time of Arrival	Boarding	Alighting	On Board Female pax
10	FDC crossing	2:04		27	0	1
	Begunbari	2:07	2:06	7	0	3
	Gulshan aarong	2:09	2:08	5	0	5
	Police plaza	2:11	2:10	0	2	5
	Merul badda	2:13	2:11	0	3	4
	Rampura		2:13	0	34	0
	Rampura	2:13	2:13	28	0	1
	Mohanagar project	2:17	2:16	4	6	5
	Modhubag	2:20	2:19	0	3	5
	Boubazaar	2:21	2:21	0	7	5
	FDC crossing		2:22	0	16	0

Trip No	Name of the Stoppages	Time of Departure	Time of Arrival	Boarding	Alighting	On Board Female pax
11	FDC crossing	2:25		12	0	1
	Begunbari	2:28	2:27	9	0	1
	Gulshan aarong	2:31	2:30	5	0	1
	Police plaza	2:33	2:32	4	0	2
	Merul badda	2:36	2:35	0	0	2
	Rampura		2:37	0	30	0
	Rampura	2:38	2:37	20	0	0
	Mohanagar project	2:42	2:41	5	0	0
	Modhubag	2:45	2:44	2	0	0
	Boubazaar	2:47	2:46	0	0	0
	FDC crossing		2:49	0	27	0

Trip No	Name of the Stoppages	Time of Departure	Time of Arrival	Boarding	Alighting	On Board Female pax
12	FDC crossing	3:05		15	0	1
	Begunbari	3:09	3:08	6	0	2
	Gulshan aarong	3:12	3:11	4	0	2
	Police plaza	3:15	3::14	1	0	2
	Merul badda	3:17	3:16	0	6	0
	Rampura		3:19	0	20	0
	Rampura	3:20	3:19	19	0	3
	Mohanagar project	3:24	3:23	4	0	3
	Modhubag	3:27	3:26	3	0	3
	Boubazaar	3:29	3:28	0	3	0
	FDC crossing		3:40	0	23	0

Trip No	Name of the Stoppages	Time of Departure	Time of Arrival	Boarding	Alighting	On Board Female pax
13	FDC crossing	4:00		26	0	4
	Begunbari	4:04	4:03	5	3	2
	Gulshan aarong	4:07	4:06	4	0	2
	Police plaza	4:09	4:08	1	6	2
	Merul badda	4:12	4:11	2	0	2
	Rampura		4:15	0	29	0
	Rampura	4:16	4:15	15	0	0
	Mohanagar project	4:20	4:19	3	0	0
	Modhubag	4:23	4:22	4	0	0
	Boubazaar	4:25	4:25	0	0	0
	FDC crossing		4:26	0	22	0

Trip No	Name of the Stoppages	Time of Departure	Time of Arrival	Boarding	Alighting	On Board Female pax
14	FDC crossing	4:27		12	0	0
	Begunbari	4:30	4:29	8	0	2
	Gulshan aarong	4:33	4:32	3	0	2
	Police plaza	4:35	4:34	2	0	2
	Merul badda	4:36	4:36	0	0	2
	Rampura		4:38	0	25	2
	Rampura	4:39	4:38	19	0	3
	Mohanagar project	4:42	4:41	6	0	3
	Modhubag	4:45	4:44	4	0	3
	Boubazaar	4:47	4:47	0	0	3
	FDC crossing		4:48	0	26	0

Trip No	Name of the Stoppages	Time of Departure	Time of Arrival	Boarding	Alighting	On Board Female pax
15	FDC crossing	5:05		28	0	2
	Begunbari	5:09	5:08	3	0	2
	Gulshan aarong	5:12	5:11	4	6	2
	Police plaza	5:14	5:13	3	7	1
	Merul badda	5:16	5:16	0	0	1
	Rampura		5:18	0	25	0
	Rampura	5:19	5:18	26	0	4
	Mohanagar project	5:23	5:22	2	0	4
	Modhubag	5:26	5:25	3	0	4
	Boubazaar	5:28	5:27	0	0	4
	FDC crossing		5:29	0	31	0

Trip No	Name of the Stoppages	Time of Departure	Time of Arrival	Boarding	Alighting	On Board Female pax
16	FDC crossing	6:10		28	0	2
	Begunbari	6:13	6:12	1	0	2
	Gulshan aarong	6:16	6:15	0	4	2
	Police plaza	6:17	6:17	3	0	2
	Merul badda	6:20	6:19	1	0	2
	Rampura		6:22	0	29	0
	Rampura	6:23	6:22	17	0	0
	Mohanagar project	6:27	6:26	8	0	1
	Modhubag	6:30	6:29	4	0	1
	Boubazaar	6:33	6:32	0	0	0
	FDC crossing		6:34	0	28	0

Trip No	Name of the Stoppages	Time of Departure	Time of Arrival	Boarding	Alighting	On Board Female pax
17	FDC crossing	4:27		17	0	2
	Begunbari	4:30	7:18	5	0	2
	Gulshan aarong	4:33	7:21	4	0	2
	Police plaza	4:35	7:23	0	0	2
	Merul badda	4:36	7:25	1	0	2
	Rampura		7:28	0	27	0
	Rampura	4:39	4:38	29	0	0
	Mohanagar project	4:42	4:41	4	0	0
	Modhubag	4:45	4:44	0	0	0
	Boubazaar	4:47	4:47	0	6	0
	FDC crossing		4:48	0	27	0

Route-2: FDC to Rampura- Rampura to FDC Bus Type :Circular			
Trip No	Total Travel Time(min)	Distance (km)	Travel Speed (km/h)
01	17	8.8	31.05882
02	17	8.8	31.05882
03	19	8.8	27.78947
04	17	8.8	31.05882
05	27	8.8	19.55556
06	23	8.8	22.95652
07	15	8.8	35.2
08	18	8.8	29.33333
09	17	8.8	31.05882
10	17	8.8	31.05882
11	23	8.8	22.95652
12	33	8.8	16
13	24	8.8	22
14	20	8.8	26.4
15	25	8.8	21.12
16	26	8.8	20.30769
17	21	8.8	25.14286

Speed variation along the day	
Period	Avg Travel Speed(km/h)
Morning	27.95294118
Noon	26.4
Afternoon	20.57142857
Evening	22

Period	Avg Travel Time(km/h)
Morning	18.88888889
Noon	20
Afternoon	25.66666667
Evening	24

Name of the Stoppages	Boarding	Alighting	On Board Passenger Occupancy	On Board Female pax
FDC crossing	28	0	28	2
Begunbari	3	0	31	2
Gulshan aarong	0	0	31	2
Police plaza	2	5	28	1
Merul badda	4	0	32	0
Rampura	0	32	0	0
Rampura	25	0	25	0
Mohanagar project	7	0	32	1
Modhubag	3	0	35	2
Boubazaar	0	7	35	2
FDC crossing	0	28	0	0

Name of the Stoppages	On Board Passenger Occupancy	On Board Female pax
FDC crossing	28	2
Begunbari	31	2
Gulshan aarong	31	2
Police plaza	28	1
Merul badda	32	0
Rampura	0	0
Rampura	25	0
Mohanagar project	32	1
Modhubag	35	2
Boubazaar	35	2
FDC crossing	0	0

Data of Semi Circular bus: Trip (1-10) on route-1

Trip No	Sr. No	Name of the Stoppages	Time of Departure	Boarding	Alighting	On Board Female pax
1	1	Mohammadpur-1	8:15	19	0	6
	2	Mohammadpur-2	8:21	12	0	4
	3	Shankar	8:26	3	1	1
	4	Dhanmondi 15	8:28	5	0	2
	5	Abahani Play Ground	8:31	2	0	0
	6	Jigatola	8:35	3	0	0
	7	City College	8:40	0	13	0
	8	Dhaka College	8:45	0	5	0
	9	New Market	8:46	0	15	0
	10	Azimpur	9:03	0	6	0
	11	Polashi	9:03	0	5	0

Trip No	Sr. No	Name of the Stoppages	Time of Departure	Boarding	Alighting	On Board Female pax
2	1	Polashi	0	0	0	0
	2	Azimpur	9:28	13	0	3
	3	New Market	9:40	7	0	2
	4	Dhaka College	9:41	0	0	0
	5	City College	9:47	6	2	3
	6	Jigatola	9:54	3	0	1
	7	Abahani Play Ground	9:58	0	2	0
	8	Dhanmondi 15	10:02	0	3	0
	9	Shankar	10:06	0	2	0
	10	Mohammadpur-2	10:13	0	18	0
	11	Mohammadpur-1	10:15	0	4	0

Trip No	Sr. No	Name of the Stoppages	Time of Departure	Boarding	Alighting	On Board Female pax
3	1	Mohammadpur-1	10:34	29	0	5
	2	Mohammadpur-2	10:38	8	0	2
	3	Shankar	10:46	11	1	9
	4	Dhanmondi 15	10:48	2	2	0
	5	Abahani Play Ground	10:05	4	0	0
	6	Jigatola	10:53	6	0	1
	7	City College	10:57	2	8	0
	8	Dhaka College	11:00	0	3	0
	9	New Market	11:01	0	10	0
	10	Azimpur	11:08	0	20	0
	11	Polashi	11:11	0	18	0

Trip No	Sr. No	Name of the Stoppages	Time of Departure	Boarding	Alighting	On Board Female pax
4	1	Polashi	0	0	0	0
	2	Azimpur	11:34	9	0	4
	3	New Market	11:04	8	0	4
	4	Dhaka College	11:42	0	0	0
	5	City College	11:47	9	2	8
	6	Jigatola	11:51	1	1	0
	7	Abahani Play Ground	11:53	0	2	0
	8	Dhanmondi 15	11:55	0	2	0
	9	Shankar	11:56	0	1	0
	10	Mohammadpur-2	12:02	0	14	0
	11	Mohammadpur-1	12:04	0	5	0

Trip No	Sr. No	Name of the Stoppages	Time of Departure	Boarding	Alighting	On Board Female pax
5	1	Mohammadpur-1	12:21	30	0	4
	2	Mohammadpur-2	12:27	17	0	3
	3	Shankar	12:34	4	0	2
	4	Dhanmondi 15	12:37	1	0	0
	5	Abahani Play Ground	12:39	0	2	0
	6	Jigatola	12:42	0	6	0
	7	City College	12:46	0	7	0
	8	Dhaka College	12:49	0	2	0
	9	New Market	12:52	0	25	0
	10	Azimpur	1:03	0	6	0
	11	Polashi	1:05	0	4	0

Trip No	Sr. No	Name of the Stoppages	Time of Departure	Boarding	Alighting	On Board Female pax
6	1	Polashi	1:08	0	0	0
	2	Azimpur	1:35	28	0	6
	3	New Market	1:52	29	0	7
	4	Dhaka College	1:55	0	0	0
	5	City College	2:00	7	0	2
	6	Jigatola	2:005	0	6	0
	7	Abahani Play Ground	2:08	1	3	0
	8	Dhanmondi 15	2:10	0	2	0
	9	Shankar	2:12	0	10	0
	10	Mohammadpur-2	2:16	0	22	0
	11	Mohammadpur-1	2:18	0	22	0

Trip No	Sr. No	Name of the Stoppages	Time of Departure	Boarding	Alighting	On Board Female pax
7	1	Mohammadpur-1	2:30	26	0	6
	2	Mohammadpur-2	2:35	12	0	3
	3	Shankar	2:21	3	0	1
	4	Dhanmondi 15	2:44	4	2	0
	5	Abahani Play Ground	2:47	3	0	0
	6	Jigatola	2:50	4	0	0
	7	City College	2:55	2	10	0
	8	Dhaka College	3:03	0	5	0
	9	New Market	3:07	0	17	0
	10	Azimpur	3:15	0	13	0
	11	Polashi	3:18	0	7	0

Trip No	Sr. No	Name of the Stoppages	Time of Departure	Boarding	Alighting	On Board Female pax
8	1	Polashi	3:19	0	0	0
	2	Azimpur	3:36	30	0	10
	3	New Market	3:48	19	0	6
	4	Dhaka College	3:50	0	0	0
	5	City College	3:58	8	0	4
	6	Jigatola	4:03	0	5	0
	7	Abahani Play Ground	4:06	0	11	0
	8	Dhanmondi 15	4:08	0	3	0
	9	Shankar	4:11	0	7	0
	10	Mohammadpur-2	4:16	0	19	0
	11	Mohammadpur-1	4:25	0	12	0

Trip No	Sr. No	Name of the Stoppages	Time of Departure	Boarding	Alighting	On Board Female pax
9	1	Mohammadpur-1	4:47	24	0	6
	2	Mohammadpur-2	4:58	10	0	3
	3	Shankar	5:10	5	0	1
	4	Dhanmondi 15	5:14	2	0	0
	5	Abahani Play Ground	5:17	3	0	2
	6	Jigatola	5:21	8	5	3
	7	City College	5:27	1	11	0
	8	Dhaka College	5:35	0	7	0
	9	New Market	5:41	0	18	0
	10	Azimpur	5:51	0	6	0
	11	Polashi	5:55	0	6	0

Trip No	Sr. No	Name of the Stoppages	Time of Departure	Boarding	Alighting	On Board Female pax
10	1	Polashi	17:59	0	0	6
	2	Azimpur	18:47	20	0	12
	3	New Market	18:48	38	0	0
	4	Dhaka College	18:52	0	0	2
	5	City College	18:58	4	0	0
	6	Jigatola	19:03	0	10	0
	7	Abahani Play Ground	19:03	0	7	0
	8	Dhanmondi 15	19:07	0	5	0
	9	Shankar	19:10	0	7	0
	10	Mohammadpur-2	19:16	0	28	0
	11	Mohammadpur-1		0	5	0

Route- 1: Mohammadpur to Polashi Bus Type: Semi Circular Bus			
Trip No	Total Travel Time(min)	Distance (km)	Travel Speed (km/h)
01	48	5.1	6.375
03	37	5.1	8.27027027
05	44	5.1	6.954545455
07	6	48	5.1
09	68	5.1	4.5

Route- 1: Polashi to Mohammadpur Bus Type: Semi Circular			
Trip No	Total Travel Time(min)	Distance (km)	Travel Speed (km/h)
02	47	5.1	6.5106383
04	30	5.1	10.2
06	50	5.1	6.12
08	66	5.1	4.636363636
10	77	5.1	3.974025974

Speed Variation along the day	
Period	Avg Travel Speed(km/h)
Morning	7.838977
Noon	6.537273
Afternoon	5.170455
Evening	3.974026

Data of Local bus: Trip (1-10) on route-1

Trip No	Sr. No	Name of the Stoppages	Time of Departure	Time of Arrival	Boarding	Alighting	On Board Female pax
1	1	Mohammadpur-1				0	0
	2	Mohammadpur-2	7:20		13	0	2
	3	Shankar	7:26	7:25	6	2	2
	4	Dhanmondi 15	7:29	7:28	4	3	2
	5	Abahani Play Ground	7:32	7:31	3	0	1
	6	Jigatola	7:35	7:34	7	1	0
	7	City College	7:38	7:37	2	7	1
	8	Dhaka College	7:42	7:41	3	5	0
	9	New Market	7:44	7:43	0	8	0
	10	Azimpur		7:49	0	10	0
	11	Polashi			0		0

Trip No	Sr. No	Name of the Stoppages	Time of Departure	Time of Arrival	Boarding	Alighting	On Board Female pax
2	1	Polashi	0		0	0	0
	2	Azimpur	7:55		11	0	4
	3	New Market	8:09	8:06	14	0	6
	4	Dhaka College	8:10	8:10	2	0	2
	5	City College	8:13	8:12	4	6	2
	6	Jigatola	8:18	8:17	3	12	1
	7	Abahani Play Ground	8:25	8:24	0	1	0
	8	Dhanmondi 15	8:28	8:27	7	3	0
	9	Shankar	8:32	8:31	0	0	0
	10	Mohammadpur-2		8:38	0	20	0
	11	Mohammadpur-1			0		0

Trip No	Sr. No	Name of the Stoppages	Time of Departure	Time of Arrival	Boarding	Alighting	On Board Female pax
3	1	Mohammadpur-1				0	
	2	Mohammadpur-2	8:53		16	0	4
	3	Shankar	8:58	8:58	4	1	5
	4	Dhanmondi 15	9:01	9:00	3	2	6
	5	Abahani Play Ground	9:06	9:05	2	0	6
	6	Jigatola	9:11	9:10	5	2	6
	7	City College	9:17	9:16	2	3	5
	8	Dhaka College	9:22	9:21	0	5	4
	9	New Market	9:25	9:24	0	6	2
	10	Azimpur		9:41	0	13	0
	11	Polashi			0		0

Trip No	Sr. No	Name of the Stoppages	Time of Departure	Time of Arrival	Boarding	Alighting	On Board Female pax
4	1	Polashi	0		0	0	0
	2	Azimpur	9:47		19	0	6
	3	New Market	10:04	10:03	10	0	10
	4	Dhaka College	10:05	10:05	0	0	10
	5	City College	10:10	10:10	5		12
	6	Jigatola	10:16	10:14	5	6	13
	7	Abahani Play Ground	10:20	10:19	3	5	11
	8	Dhanmondi 15	10:26	10:25	2	6	10
	9	Shankar	10:32	10:31	0	7	8
	10	Mohammadpur-2		10:37	0	20	0
	11	Mohammadpur-1			0		0

Trip No	Sr. No	Name of the Stoppages	Time of Departure	Time of Arrival	Boarding	Alighting	On Board Female pax
5	1	Mohammadpur-1				0	
	2	Mohammadpur-2	10:49		22	0	6
	3	Shankar	10:58	10:57	6	1	8
	4	Dhanmondi 15	10:05	11:03	3	2	7
	5	Abahani Play Ground	11:10	11:09	5	2	7
	6	Jigatola	11:17	11:15	6	2	11
	7	City College	11:27	11:26	2	5	9
	8	Dhaka College	11:34	11:33	0	3	9
	9	New Market	11:37	11:35	0	18	5
	10	Azimpur		11:45	0	12	0
	11	Polashi			0		0

Trip No	Sr. No	Name of the Stoppages	Time of Departure	Time Of Arrival	Boarding	Alighting	On Board Female pax
6	1	Polashi			0	0	0
	2	Azimpur	11:50		16	0	5
	3	New Market	12:04	12:03	12	0	9
	4	Dhaka College	12:05	12:05	0	0	9
	5	City College	12:11	12:10	7	0	12
	6	Jigatola	12:19	12:17	5	3	11
	7	Abahani Play Ground	12:27	12:25	3	5	11
	8	Dhanmondi 15	12:34	12:33	2	7	10
	9	Shankar	12:41	12:40	0	5	8
	10	Mohammadpur-2		12:59	0	20	0
	11	Mohammadpur-1			0		0

Trip No	Sr. No	Name of the Stoppages	Time of Departure	Time of Arrival	Boarding	Alighting	On Board Female pax
7	1	Mohammadpur-1					
	2	Mohammadpur-2	1:26		21	0	7
	3	Shankar	1:37	1:36	6	2	13
	4	Dhanmondi 15	1:38	1:38	3	0	14
	5	Abahani Play Ground	1:42	1:40	4	0	15
	6	Jigatola	1:44	1:43	5	0	17
	7	City College	1:54	1:50	0	2	17
	8	Dhaka College	1:58	1:57	0	7	13
	9	New Market	2:00	1:59	0	17	7
	10	Azimpur		2:17	0	13	0
	11	Polashi			0		0

Trip No	Sr. No	Name of the Stoppages	Time of Departure	Time of Arrival	Boarding	Alighting	On Board Female pax
8	1	Polashi			0	0	0
	2	Azimpur	2:33		13	0	5
	3	New Market	2:56	2:54	17	0	8
	4	Dhaka College	2:57	2:57	0	0	8
	5	City College	3:12	3:10	5	0	10
	6	Jigatola	3:24	3:23	9	7	8
	7	Abahani Play Ground	3:30	3:29	2	5	6
	8	Dhanmondi 15	3:34	3:33	1	9	5
	9	Shankar	3:39	3:38	0	5	4
	10	Mohammadpur-2		3:55	0	16	0
	11	Mohammadpur-1			0		0

Trip No	Sr. No	Name of the Stoppages	Time of Departure	Time of Arrival	Boarding	Alighting	On Board Female pax
9	1	Mohammadpur-1				0	
	2	Mohammadpur-2	4:17		18	0	6
	3	Shankar	4:31	4:29	7	0	9
	4	Dhanmondi 15	4:37	4:36	6	0	11
	5	Abahani Play Ground	4:44	4:43	5	2	10
	6	Jigatola	4:53	4:51	6	3	7
	7	City College	5:02	5:01	2	5	5
	8	Dhaka College	5:11	5:10	0	7	4
	9	New Market	5:13	5:12	0	10	3
	10	Azimpur		5:31	0	17	0
	11	Polashi			0		0

Trip No	Sr. No	Name of the Stoppages	Time of Departure	Time Of Arrival	Boarding	Alighting	On Board Female pax
10	1	Polashi			0	0	
	2	Azimpur	5:47		23	0	9
	3	New Market	6:05	6:03	10	0	12
	4	Dhaka College	6:04	6:04	0	0	12
	5	City College	6:16	6:14	7	0	14
	6	Jigatola	6:29	6:27	3	7	12
	7	Abahani Play Ground	6:38	6:37	2	3	11
	8	Dhanmondi 15	6:43	6:45	1	6	10
	9	Shankar	6:54	6:53	0	9	7
	10	Mohammadpur-2		7:18	0	21	0
	11	Mohammadpur-1			0		0

Route- 1: Mohammadpur to Polashi Local Bus			
Trip No	Total Travel Time(min)	Distance (km)	Travel Speed (km/h)
01	24	5.1	12.75
03	32	5.1	9.5625
05	48	5.1	6.375
07	34	5.1	9
09	56	5.1	5.464285714

Route- 1: Polashi to Mohammadpur Local Bus			
Trip No	Total Travel Time(min)	Distance (km)	Travel Speed (km/h)
02	37	5.1	8.27027027
04	45	5.1	6.8
06	51	5.1	6
08	66	5.1	4.636363636
10	67	5.1	4.567164179

Speed Variation along the day	
Period	Avg Travel Speed(km/h)
Morning	9.345693
Noon	6.1875
Afternoon	6.366883
Evening	4.567164

Name of the Stoppages	Boarding	Alighting	On Board Passenger Occupancy	On Board Female pax
Mohammadpur-1		0		
Mohammadpur-2	21	0	21	7
Shankar	6	2	25	13
Dhanmondi 15	3	0	28	14
Abahani Play Ground	4	0	32	15
Jigatola	5	0	37	17
City College	2	2	37	17
Dhaka College	0	7	30	13
New Market	0	17	13	7
Azimpur	0	13	0	0
Polashi	0	0	0	0

Department of Civil Engineering, Daffodil International University

নগরীর বাস রুট সমূহে প্রদত্ত সেবা মূল্যায়নের জন্য জরিপ

আপনার যাত্রা শুরুর সময়ঃ যাত্রা সমাপ্তির সময়ঃ

সাক্ষাৎকারদাতার বিবরণঃ পুরুষ / মহিলা বয়সঃ কিশোর / পূর্ণবয়স্ক / বৃদ্ধ

পেশাঃ

অনুগ্রহ পূর্বক এখান থেকে পূরণ করুনঃ

১। যে স্টপেজ থেকে **উঠলেনঃ** যে স্টপেজে **নামবেনঃ**

২। কতদিন ধরে এই রুটে যাতায়াত করেনঃ **__দিন** বা **__ সপ্তাহ** বা **__মাস** বা **__ বছর**

৩। আপনি কিভাবে বাস ধরতে এসেছেন- হেটে / রিক্সা / ----------

৪। বিগত কতদিন ধরে এই রুটে লোকাল বাস ব্যবহার করেনঃ **__ দিন** বা **__ সপ্তাহ** বা **__ মাস**

৫। সাধারণত কতবার এই রুটে লোকাল বাস ব্যবহার করেনঃ প্রতি সপ্তাহে____ দিন বা প্রতি মাসে ____দিন

৬। লোকাল বাস না পেলে আপনি কিসে যাতায়ত করতেন?

ক)রিক্সা খ) সাইকেল গ) চক্রাকার বাস ঘ) ঙ)উবার চ)C.N.G. ছ)হেটে

৭। বাস পেতে আপানাকে কতক্ষন অপেক্ষা করতে হয়?

ক)অপেক্ষা করতে হয় না খ)০-২ মিনিট গ)২-৫ মিনিট ঘ)৫-১০ মিনিট ঙ))১০ -২০ মিনিট

৮। আপনার ভ্রমনের উদ্দেশ্যঃ

ক)অফিস খ)সামাজিক গ) শিক্ষা ঘ)বিনোদন ঙ)শপিং চ) অন্যান্য

৯। বর্তমানে যে হারে লোকাল বাস পাওয়া যায় তাতে আপনি সন্তুষ্ট কি না ?

ক) হ্যাঁ খ) না গ) মন্তব্য নেই

১০। লোকাল বাসে ভ্রমনকালে নারীদের নিরাপত্তা নিয়ে আপনার মতামত?

ক)পর্যাপ্ত খ) অপর্যাপ্ত

কেন পর্যাপ্ত বলে মনে করেন ?	কেন অপর্যাপ্ত বলে মনে করেন ?
ক)পৃথক আসন	ক)পৃথক আসন নাই
খ)ইভটিজিইং নাই	খ)ইভটিজিইং
গ)পর্যাপ্ত আসন সংখ্যা	গ)পর্যাপ্ত আসন সংখ্যা নাই
ঘ)যাত্রীদের ভদ্র ব্যবহার	ঘ)যাত্রীদের ভদ্র ব্যবহার নয়
ঙ)বাসের স্টাফদের ভদ্র ব্যবহার	ঙ)বাসের স্টাফদের ভদ্র ব্যবহার নয়

১১। বাসে উঠা এবং নামার সময় আপনি কি কোন সমস্যার সম্মুক্ষীণ হন?
ক)হ্যা খ)না
❖ যদি হ্যাঁ- হয় তবে কেন ?

ক) সামনে ভীড় বেশী
খ)অতিরিক্ত দাঁড়ানো যাত্রী
গ)স্টপজে দাঁড়ানোর সময় কম
ঘ)বাসে নামা /উঠার সিড়ি উচু
ঙ)রাস্তার তুলনায় বাসের ফ্লোর উচু
চ)অন্যান্য

১২।আপনি কি লোকাল বাস সার্ভিসটা অন্যকে ব্যবহার করতে বলবেন ?
ক)হ্যা খ)না

উত্তর হ্যা হলে- কেন ব্যবহার করতে বলবেন-	উত্তর না হলে- কেন ব্যবহার করতে বলবেন না-
ক) সময় কম লাগে	ক) সময় বেশী লাগে
খ)আরামদায়ক	খ)আরামদায়ক নয়
গ)স্টাফদের ব্যবহা র ভাল	গ)স্টাফদের ব্যবহার ভাল না
ঘ)নিরাপদ	ঘ)নিরাপদ নয়
ঙ)সঠিক সময়ে বাস পান	ঙ)সঠিক সময়ে বাস পান না

১৩। আপনি এই ভ্রমণে কি কি সমস্যার মুখোমুখি হন-
- রাস্তার জ্যাম।
- ভ্রমণের দীর্ঘ সময় লাগে।
- বাসে ভীড়।
- নিয়মিত বাস পাওয়া যায় না।
- বেশী ভাড়া লাগে।
- হেলপারদের খারাপ ব্যবহার।
- বাসে উঠানামার সময় সমস্যা।
- বাসে সব স্টপেজে উঠলে বসার আসন পাওয়া যায় না।
- ধীরে গতির বাস।
- বাস দীর্ঘ সময় স্টপেজে দাঁড়িয়ে থাকে।

১৪। কি কি পদক্ষেপ নিলে এই সমস্যা/সমস্যাগুলো সমাধান হবে বলে আপনি মনে করেন?

Trip No:

B/A Survey

From FDC to Rampura

Sr. No	Name of the Stoppages	Time of Arrival	Time of Departure	Boarding	Alighting	On Board Female Pax
01	FDC crossing				0	
02	Begunbari					
03	Gulshan aarong					
04	Police plaza					
05	Mreul badda					
06	Rampura			0		
Any Comments:						

Trip No:

B/A Survey

From FDC to Rampura

Sr. No	Name of the Stoppages	Time of Arrival	Time of Departure	Boarding	Alighting	On Board Female Pax
01	Rampura				0	
02	Mohanagar project					
03	Modhubag					
04	Boubazar					
05	FDC crossing			0		
Any Comments:						