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# Assessment of the satisfaction of bus passengers: Evidence from Dhaka, Bangladesh

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## Abstract

Increased population results in an increase in travel demand. Greater road length and construction of new roads result in faster and longer travels and increased car ownership, which contributes to increased traffic congestion and pollution. The bus form of travel is a critical component of resolving this issue. A bus can carry 30-40 passengers per trip; on the other hand, a private car carries 2-3 passengers per trip. So, bus transport could decrease the number of vehicles on the road if it can provide better service quality in bus mode. In this experiment, the main objectives are to understand better passengers' satisfaction with bus transport on the Uttara-Gazipur route and predict the individual factors contributing to the comfort of the bus modes on this route. A questionnaire survey form was created to evaluate this result with about 19 service quality parameters such as safe speed, temperature, noise, required time, waiting time for the bus, station service, seat comfort service, cleanness, staff behavior, and payment system fare. In this experiment, opinions of 100 passengers were collected regarding service quality. Data were analyzed using descriptive and multiple linear regression, analyzed by SPSS software. One main finding reported that passengers are not satisfied yet with bus service quality. This study revealed that 75% of feedback was poor or very poor, and 25% was positive or good regarding the level of satisfaction for bus mode. The regression analysis reported that the overall P-value is less than 0.05 and the regression coefficient,  $R^2$  is 0.64, which rejected the null hypothesis and made the survey significant in assessing the overall comfort of passengers traveling by bus on the Uttara-Gazipur route. It was also found that three parameters: reliability ( $\beta = 0.170$ ,  $P=0.027$ ), safe speed ( $\beta = 0.240$ ,  $P = 0.021$ ) and travel time ( $\beta = 0.320$ ,  $P = 0.01$ ) are individually contributing to overall satisfaction of passenger in Uttara-Gazipur route.

**Keywords:** Passenger satisfaction, comfort, bus transportation, transport risk, service quality, public transport

## 1. Introduction

Understanding and analyzing the expectations and wants of customers is critical to customer satisfaction in public transportation. Designing a service around the consumer's needs is essential to improving the quality of the service [1]. Customer or passenger needs, such as frequency,

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convenience, safety, and so on, are critical considerations in the public transportation industry [2]. These passenger needs must be translated into quality requirements using some technique. Customers, for example, have high expectations of service from transportation providers. Operators must develop solutions and modify their quality criteria to meet that need [3]. To meet this passenger demand, the operator needs to have a quality factors such as punctuality, regularity, trip time, and so on [4]. Transport firms in the service industry need not only a methodology for figuring out what passengers want and need but also a strategy for turning those expectations into service standards [5].

A transport service is marked by a series of factors such as comfort, reliability, service programming, etc. The convenience of rides is considered one of the top criteria affecting passenger satisfaction with public transport systems [6][7][8][9][10]. People often do not use public transport (PT) despite having good accessibility due to inconvenience and discomfort [11]. As a result, bus operators and authorities have placed a higher premium on improving bus comfort to attract more people to PT and further reduce traffic congestion [7]. Additionally, identifying factors that affect bus comfort may assist policymakers in implementing focused improvement strategies [12]. Several studies have been conducted to measure the comfort of a public bus in various methods.

In contrast, many theories have been proposed to explain the factors responsible for affecting it [13]. Public bus comfort studies can be divided broadly into two categories – one is measuring comfort using by mechanical approach, and the other is by a qualitative approach [14]. The automated system measures the variables that may significantly affect comfort utilizing the equipment. The qualitative approach collects the perception of various comfort components from (PT) users through a questionnaire survey [15].

The service level fully measures all service characteristics that affect users [10]. Travel duration, safe speed, reliability, bus fitness, seating arrangement, station service, fare, payment method, security of goods, driver experience, noise pollution, temperature, seat comfort, cleanliness, and bus personnel behavior are all variables that affect the degree of service [16]. At locations where passengers must wait, amenities for shelter, comfort (i.e., sitting arrangements), and safety are required. As a result, pauses or stations are critical for public transportation [17]. Aside from the physical challenges, public transportation service relies on scheduling, vehicle operation and supervision, fare collection, and maintenance. Line capacity, service frequency, operating speed, reliability, safety, and productive capacity have all been cited as critical performance components [18]. There are a variety of challenges that affect public transportation operations, including reliability, passenger comfort, and safety [19].

Compared to private transportation, public transportation (also known as public transit, mass transit, or just transit) is a mode of public transportation for passengers that are often scheduled and operated on set routes. It charges a listed fare for each trip [20]. Public transportation includes city buses, trolleybuses, trams, passenger trains, and fast transit. Intercity public transportation is dominated by airlines, coaches, and intercity rail [21]. Numerous countries throughout the world are developing high-speed rail networks. Most public transit systems operate along defined routes with predetermined embarkation/disembarkation points and on a fixed schedule, with the most frequent

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services operating at a headway [22]. However, most public transit trips require passengers to walk or take a bus to train stations.

Present Dhaka's bus service is failing at an alarming rate. The bus business in Dhaka is unprofitable at the moment [23]. To put it another way, bus owners and operators fail to reinvest their money in local transportation services due to the lack of bus service growth. Drivers fight for passengers by creating obstructions around junctions so that buses can't overtake one other and don't care about passengers' safety while boarding. Dhaka Metro Regional Transport Committee (DMRTC) has issued the route permits to the operator without considering passenger demand or the need for multiple bus operators to operate on the same routes. In the current system, the route permit is typically granted based on a request from the operator. Most bus firms run their vehicles on the busiest routes to maximize profits. This means that most bus firms only run their buses on routes with high-profit margins, putting passengers at risk in the process. Airport road alone has roughly 60 bus routes fighting against each other. Operators are losing money due to this unfair competition, and passengers aren't getting the needed services. Business plans are what's causing the most trouble. There are a variety of risks involved in operating bus services in Dhaka, but the government is not taking any [24]. The fare collection mechanism is also a severe issue. The drivers, conductors, and helpers of transportation services are not paid for their work. Thus, bus companies rent their vehicles daily to drivers for a fixed fee. This driver, who hires the bus daily, has only one goal: to make as much money as possible. The study's main objectives are as follows: (a) To predict the factors affecting or contributing to the comfort of the bus modes in Uttara to Gazipur, and (b) To gain a better understanding of overall passengers' satisfaction with public bus transport in Uttara-Gazipur route.

## 2. Methodology

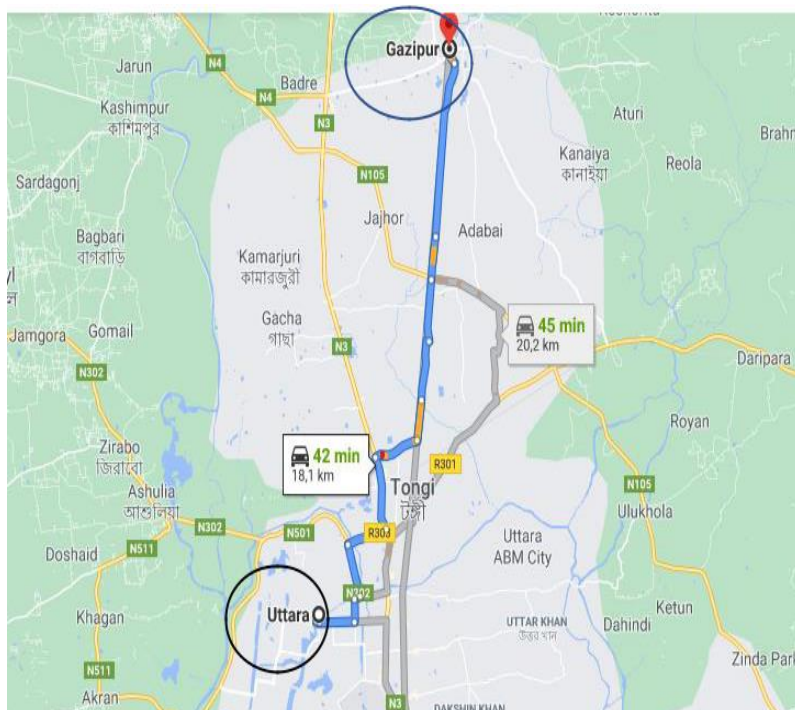
### 2.1. Participants and procedure

The study was conducted on 100 bus passengers from the Uttara-Gazipur route. The study has passed the ethical review of Uttara University, Dhaka, Bangladesh. Passengers were informed about the purpose of the survey before presenting the questionnaire. Subjects participated in an online messenger and email and filed a study. The survey was administered in January 2021.

### 2.2 Data collection

The data for the research that underpinned this paper are collected using a questionnaire best instrument. The first consists of questions like name, email/phone, and route user. The second part covers questions concerning service quality. There are eighteen questions in this part. Each question has five options: sound, reasonable, satisfactory, poor, and very poor. And the last part has the signature of the passengers, which confirms the validity of the data. The data were collected from December 2020 to February 2021. The data has been taken from the Uttara-Gazipur route at three station Azompur bus stand, Tongi station road, and Board Bazar. This research collected a total of 100 passenger responses from these 50 data collected online who use this route and 50 data from buses or stations on the Uttara-Gazipur route. The map of the road is attached below to recognize the way better. About 60% of the data was collected from passengers standing at different stations, and

about 40% was collected from passengers boarding various buses. Some have expressed frustration at answering the questions. Some answered the questions with great ease.



**Fig. 1.** Uttara-Gazipur route map view

### 2.3 Multiple linear regression

This manuscript used multiple linear regression (MLR) to analyze the relationship between independent variables: speed, temperature, cleanness, sound pollution, and dependent variable comfort. The significance level for the regression model is taken as 5%.

MLR model for this study can be expressed using Eq. 2.1

$$y = a + bx_1 + cx_2 + dx_3 + ex_4 + \epsilon \tag{1}$$

Where, y = overall comfort, x1= safe speed, x2= temperature, x3= cleanliness, x4= sound pollution, a = intercept, ε = error term, b, c, d, e = regression coefficients.

### 2.4 Significance level

The significance level is defined as the probability of rejecting a null hypothesis by the test when it is true, denoted as α. That is P (Type I error) = α. The significance level of 0.05 is related to the 95% confidence level [Significance Level, 2021].

### 2.5 Confidence level

A certain percentage of all possible samples are likely to include data from the actual population, known as the confidence level. All available models may be taken from the same people, and a

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confidence interval was produced for each sample. For example. A 95 percent confidence level suggests that 95 percent of the confidence intervals would contain the genuine publishing parameter.

## 2.6 Data analysis

After field data collection, the collected data were imported and organized into SPSS software. Here a total of 19 parameters are selected for measuring bus passengers' comfort and descriptive statistics. These questions are,

X1 = frequency of use these route

X2 = Presently preferred quality

X3 = Fitness of bus

X4 = Setting arrangement

X5 = Time required

X6 = Station Service

X7 = Seat comfort

X8 = cleanliness of bus

X9 = Behavior of bus Staff

X10 = Fare

X11 = Payment system

X12 = Reliability

X13 = Security of goods

X14 = Safe speed

X15 = Driver experience

X16 = Noise pollution

X17 = Air pollution

X18 = Temperature

X19 = Overall satisfactory

From these parameters X1, X2, X3, X4, X5, ..... X18 is chosen as the independent variable, and X19 is selected as the dependent variable.

The process of putting raw data into SPSS software is shown in Figures 2 to 4.

	Q1	Q2	Q3	Q4	Q5	Q6
1	bimonthly	satisfactory	poor	poor	satisfactory	good
2	Weekly	satisfactory	satisfactory	satisfactory	poor	satisfactory
3	monthly	poor	poor	poor	poor	poor
4	Daily	poor	very poor	poor	poor	very poor
5	monthly	very poor	poor	satisfactory	poor	poor
6	monthly	poor	very poor	poor	poor	poor
7	Weekly	poor	very poor	very poor	very poor	very poor
8	Weekly	very poor	very poor	very poor	very poor	very poor
9	Weekly	poor	very poor	poor	poor	satisfactory
10	Weekly	good	good	good	good	good
11	Daily	poor	very poor	very poor	satisfactory	satisfactory
12	Daily	poor	very poor	very poor	poor	poor
13	Daily	good	poor	very poor	poor	poor
14	biweekly	satisfactory	poor	satisfactory	poor	poor
15	Daily	good	good	good	good	good
16	monthly	satisfactory	satisfactory	poor	very poor	poor
17	Weekly	poor	very poor	poor	very poor	very poor
18	monthly	poor	poor	poor	satisfactory	satisfactory
19	Daily	poor	very poor	poor	very poor	very poor
20	Weekly	very poor	very poor	very poor	poor	poor
21	Weekly	very poor	very poor	poor	very poor	poor

**Fig. 2.** Partial data view of SPSS statistics data

	Q1	Q2	Q3	Q4	Q5	Q6
1	5	3	2	2	3	4
2	2	3	3	3	2	3
3	4	2	2	2	2	2
4	1	2	1	2	2	1
5	4	1	2	3	2	2
6	4	2	1	2	2	2
7	2	2	1	1	1	1
8	2	1	1	1	1	1
9	2	2	1	2	2	3
10	2	4	4	4	4	4
11	1	2	1	1	3	3
12	1	2	1	1	2	2
13	1	4	2	1	2	2
14	3	3	2	3	2	2
15	1	4	4	4	4	4
16	4	3	3	2	1	2
17	2	2	1	2	1	1
18	4	2	2	2	3	3
19	1	2	1	2	1	1
20	2	1	1	1	2	2
21	2	1	1	2	1	2

**Fig. 3.** Partial data view of SPSS statistics data (convert into digit)

	Name	Type	Width	Decimals	Label	Values	Missing	Columns	Align	Measure	Role
1	Name	String	25	0	Participate Name	None	None	23	Center	Nominal	Input
2	Gender	Numeric	8	0	Gender-	{1, male}...	None	23	Center	Nominal	Input
3	Age	Numeric	8	0	Age in years	{1, 15-19}...	None	23	Center	Scale	Input
4	Users	Numeric	8	0	Using Uttara-G...	{1, yes}...	None	23	Center	Nominal	Input
5	Q1	Numeric	23	0	Frequency	{1, Daily}...	None	23	Center	Scale	Input
6	Q2	Numeric	23	0	Preferred qualit...	{1, very poor...	None	23	Center	Scale	Input
7	Q3	Numeric	8	0	Fitness of bus	{1, very poor...	None	23	Center	Scale	Input
8	Q4	Numeric	8	0	Sitting arrange...	{1, very poor...	None	23	Center	Scale	Input
9	Q5	Numeric	8	0	Time	{1, very poor...	None	23	Center	Scale	Input
10	Q6	Numeric	8	0	Station service	{1, very poor...	None	23	Center	Scale	Input
11	Q7	Numeric	8	0	Seat comfort	{1, very poor...	None	23	Center	Scale	Input
12	Q8	Numeric	8	0	Cleanliness	{1, very poor...	None	23	Center	Scale	Input
13	Q9	Numeric	8	0	Behavior of staff	{1, very poor...	None	23	Center	Scale	Input
14	Q10	Numeric	8	0	Fare	{1, very poor...	None	23	Center	Scale	Input
15	Q11	Numeric	8	0	Payment system	{1, very poor...	None	23	Center	Scale	Input
16	Q12	Numeric	8	0	Reliability	{1, very poor...	None	23	Center	Scale	Input
17	Q13	Numeric	8	0	security of goods	{1, very poor...	None	23	Center	Scale	Input
18	Q14	Numeric	8	0	Safe Speed	{1, very poor...	None	23	Center	Scale	Input
19	Q15	Numeric	8	0	Driver experience	{1, very poor...	None	23	Center	Scale	Input
20	Q16	Numeric	8	0	Noise pollution	{1, very poor...	None	23	Center	Scale	Input
21	Q17	Numeric	8	0	Air pollution	{1, very poor...	None	23	Center	Scale	Input
22	Q18	Numeric	8	0	Temperature	{1, very poor...	None	23	Center	Scale	Input
23	Q19	Numeric	8	0	Overall satisfac	{1, very poor...	None	23	Center	Scale	Input

**Fig. 4.** Variable view of SPSS statistics data

### 3. Results and Discussion

This section consists of statistical analysis results. The acquired data is subjected to demographic statistics and multiple linear regression analysis. The findings from local measurements are also provided to enhance the recommendations implemented in the local region.

#### 3.1 Demography of the respondents

This study has selected several passengers' demographic characteristics compatible with their bus journey. The preferred characteristics are age, gender, and frequency of bus use (Table 1).

**Table 1.** Profile of participants: Age and Percentage

Demographic characteristics	Categories	Percentage
Age	15-19	2
	20-29	62
	30-39	24
	40-49	10
	50-70	2

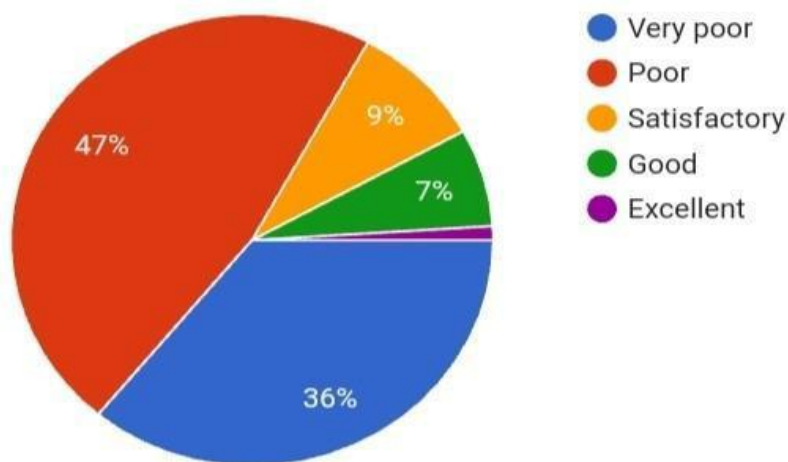
Gender	Male	80
	Female	20
Frequency of using bus	Daily	33
	Weekly	39
	Biweekly	2
	Monthly	20
	Bimonthly	5
	Quarterly	0
	Yearly	1

This study observed that most passengers who participated in the survey were between 20-39. Most of the passengers who participated in the survey were male. As displayed in Table 4.3, it can be observed that 33% of participants use the Uttara-Gazipur route daily, and 94% of participants travel along this route at least once or more a month. Sometimes, bus services are not comfortable for female passengers in Dhaka city [9]. In each bus, just six seats have been set aside for female passengers [20][25]; however, no such centers have been set aside for people with disabilities or the elderly [26].

### 3.2 Satisfaction with travel

#### 3.2.1 Duration of time

Above 80% of passengers who participated in the survey were unsatisfied with the duration of time it takes to travel on the Uttara-Gazipur route, as observed in Fig. 5.

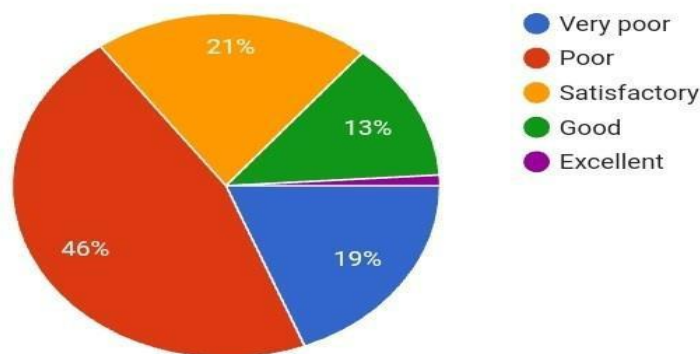


**Fig. 5.** Opinion about travel time on the Uttara-Gazipur route



### 3.2.2 Safe speed of the bus

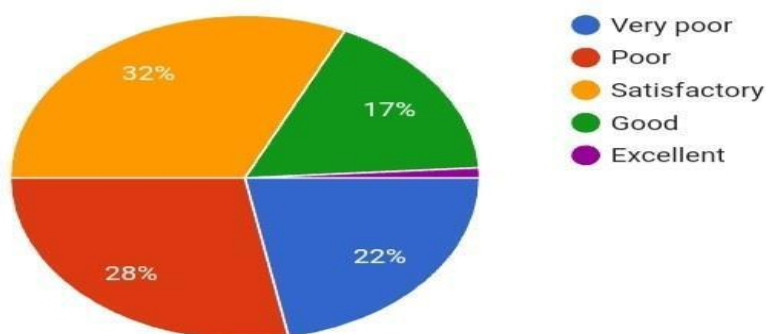
As displayed in Fig. 6, it was observed that the passengers' satisfaction with the safe speed of buses on the Uttara-Gazipur route was only 35%. It means most passengers feel unsafe with the buses' rate on this route.



**Fig. 6.** Opinion about the safe speed of the bus in the Uttara-Gazipur route

### 3.2.3 Behavior of the bus staff

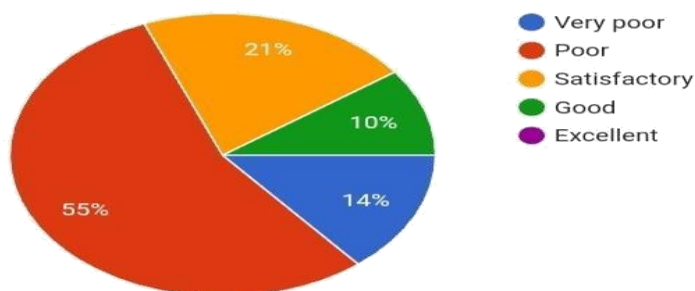
As displayed in Fig. 7, it was observed that the behavior of the bus staff in the Uttara-Gazipur route is not up to par, as 50% of the participants felt the team's attitudes as unsatisfactory.



**Fig. 7.** Behavior of the bus staff

### 3.2.4 Overall satisfaction of bus mode

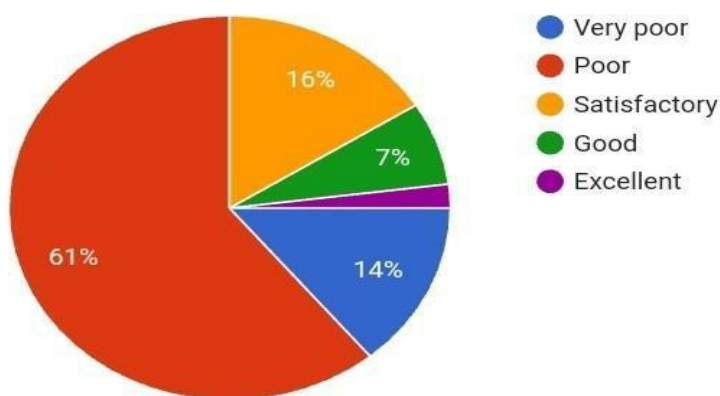
The questionnaire survey found that 69% of participants believe the consistency of bus services is poor or very poor, as shown in Fig. 8.



**Fig. 8.** Reliability of bus

### 3.2.5 Overall satisfaction of bus mode

From the questionnaire survey analysis regarding overall satisfaction of bus mode in Uttara-Gazipur route, bus passenger gave their opinion as 61% poor, 14% abysmal, 16% satisfactory, 7% good, and 1% excellent as shown in Fig. 9. It means 75% passengers were unsatisfied, and 25% passengers were satisfied with the overall service quality of bus mode in this route.



**Fig. 9.** Overall satisfaction of bus mode

### 3.3 Regression analysis

#### 3.3.1 Testing of the null hypothesis

Perception of service quality comprises about nineteen sub-dimensions (air pollution, behavior of bus staff, cleanliness, driver experience, frequency, fitness of bus, fare, noise pollution, payment system, preferred quality of bus, reliability, safe speed, seat comfort, security of goods, sitting arrangement, station service, temperature, travel time) does not influence passenger satisfaction in Uttara- Gazipur route [27][28][29](Table 2).

**Table 2.** Regression analysis of service quality with passenger satisfaction (Overall)

Model 1	P-value	F	R <sup>2</sup>	Standard error
Overall satisfaction	0.000	7.872	0.64	0.571

As displayed in Table 2, it was observed that the p-value was less than 0.05, which means if all the 18 independent variables are taken altogether into account, the prediction of the level of satisfaction in model 1 comes out the satisfactory for 5% significance level. It is also observed that the value of R<sup>2</sup> is 0.64, which means the service quality can explain 64% of the variation in passenger satisfaction. Consequently, the null hypothesis is rejected, and the study concludes that service quality influences bus passenger happiness on the Uttara-Gazipur route (Table 3).

**Table 3.** Regression analysis of service quality with passenger satisfaction (Individual)

Model 2	$\beta$	t	P-value
Reliability	0.170	3.345	0.027
Safe speed	0.240	2.347	0.021
Travel time	0.320	3.345	0.01
Air pollution	0.166	1.463	0.147
Behavior of staff	-0.035	-0.365	0.716
Cleanliness	0.014	-0.167	0.868
Driver experience	0.060	0.614	0.541
Frequency	0.170	0.237	0.813
Fitness of bus	0.096	1.126	0.263
Fare	0.172	1.817	0.073
Noise pollution	-0.123	-0.9994	0.323
Payment system	0.047	0.576	0.566
Preferred quality	0.073	0.931	0.354
Seat comfort	0.052	0.571	0.570
Security of goods	-0.177	-1.993	0.050
Temperature	0.110	1.295	0.199
Sitting arrangement	0.047	0.501	0.618
Station service	0.028	-0.352	0.726

As displayed in Table 3, three service quality dimensions have positive and significant relationship with passenger satisfaction ( $p < 0.05$ ), reliability ( $\beta = 0.170$ ,  $t = 3.345$ ,  $p = 0.027$ ), safe speed ( $\beta = 0.240$ ,  $t = 2.347$ ,  $p = 0.021$ ), travel time ( $\beta = 0.320$ ,  $t = 3.345$ ,  $p = 0.01$ ). This suggests that bus passengers will be happier if other aspects with significant beta coefficients are stressed more heavily [25]. Overall, this suggests that the level of customer service is a reliable indicator of passenger happiness and may account for some of the discrepancies seen [30]. Results show no correlation between bus passenger pleasure and perceptions of service quality in Uttara-Gazipur, which contradicts the null hypothesis.

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#### 4. Conclusions and Recommendations

The principal objective of this study is to measure comfort for buses on the Uttara-Gazipur route. Some steps needed to be taken to achieve this objective, i.e., identifying the variables, collecting data from this route, analyzing the data, and finally finding out the result. Several research studies are related to reliability, cost, safe speed, the fitness of buses, station service, payment system, seat comfort, air pollution, etc. This study will help identify the essential variables that dominate the overall comfort value. Comfort is a significant issue in the cost-benefit analysis of transportation mode selection. This study aims to quantify the comfort of passengers of bus transport by considering the key variables that impact comfort.

The level of significance for our study was set at 5%. After conducting the analysis, it is found that the values are coherent with our 5% significance level. Hence the model is satisfactory for a 5% significance level. It was also found that three parameters (reliability, safe speed, and travel time) contribute individually to passengers' overall satisfaction in the Uttara-Gazipur route. More accurate results would have been achieved if more data had been collected in the survey. If the data had been taken for a more extended period, like six months or more, then the accuracy of this study would have been much better. The result would have been much better if the data had been taken from more locations. This survey collected data through mixed methods (online and offline) because of the COVID-19 situation. But it would be better if the data were taken either offline or online.

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