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Exploring the Commuters' Willingness-to-Pay and Its Influencing Factors for an Improved Public Bus Service in Dhaka City

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Abstract

Improved transportation services are a crucial component of urban growth, particularly in emerging cities like Dhaka. Ensuring an improved public bus service quality is a challenge for the city's transport planners and policy makers. Nevertheless, this challenge can't be met without the support of the residents of this city. This study intends to evaluate the commuters' willingness to pay (WTP) for an improved and better public bus service quality in Dhaka city. It also attempts to explore the factors affecting the commuters' WTP amounts. In order to accomplish the study's goals, a stated preference survey was designed to enquire into the whys and wherefores of female passengers' harassment on public buses and also to prefer some influential service quality features. WTP values of respondents were calibrated using binary and ordinal logistic models, and these models were developed using SPSS version 26. The results indicate that the majority of respondents were willing to pay more for better service facilities, and they point to security as the most important factor in determining how much extra fare commuters are willing to pay. The results also demonstrate that commuters' WTP amounts are highly influenced by the respondents' monthly income. Results from this study have important policy implications, such as protecting women's safety on public transportation and taking commuters' socio-demographic characteristics into account before enacting any legislation or increasing fares.

Keywords

WTP, Public Bus, Harassment, Improved Service Quality, Security, Socio-Demographic Features

1. Introduction

Public transportation, particularly the public bus service, maintains a significant

role in developing the urban infrastructure of a country. For decades, the city's transport planners have been concerned with service quality measurement to acquire an overall scenario of consumer satisfaction on public transportation [1]. When accurately measured, the service quality of public buses can provide operators and public administrators with a clear picture of the utility function or quality of the services they are providing to users. In general, passenger comfort and satisfaction are important factors in residents' traffic mode choices and can be used to estimate the quality of public transportation services [2] [3].

With a population of 22.3 million in the urban area and 10.9 million in the city, Dhaka, the capital of Bangladesh, is the fifth-most densely populated city [4] and the fourth least liveable city in the world [5]. Indeed, the present poor structure and service quality level of the public buses in this city are exacerbating the city's already dire condition. Dhaka city has approximately 2500 buses for public transportation, despite a current demand of over 5000 [6]. Overcrowding, lack of comfort and security, unsafe driving practices, poor and dangerous boarding and alighting facilities, irregular service frequency, lack of cleanliness and law enforcement agency are all hallmarks of public bus service in Dhaka [7] [8].

Furthermore, the increasing incidence of female harassment and unsafe issues on public buses and stops are also affecting the service quality and women's emancipation. According to the previous studies focused on the problems faced by female commuters, women are identified as the worst sufferers of the current public bus service quality [9]. This results in people's indifferent attitude towards public bus service and an increase in private vehicles on the road. According to the Bangladesh Road Transport Authority (BRTA), there are 17.8 lakh registered motor vehicles in Dhaka city, and in the last 10 years the ratio of registered motorcycles in the metropolitan area rose by 264% [10]. A city with a well-functioning transportation system requires 25% of its land for road transportation, whereas Dhaka uses only 8% of its land for road transportation, with two-thirds of those roads having non-engineered surfaces [11]. The increasing number of private vehicles on these unstructured and unplanned roads not only makes the city's traffic system more fragile but also pollutes the environment on a large scale.

However, according to the World Economic Forum as mentioned in [12], Bangladesh has one of the world's fastest-growing economies, with a GDP growth rate of nearly 8%. In Bangladesh, women's participation in the labour force in economic undertakings is increasing day by day. In the social, commercial, educational, and administrative sectors, the majority of women have a considerable presence [13]. To keep the development on-going, the governments of Bangladesh, as well as intellectuals from the country and abroad, are proposing a variety of strategies to alleviate commuters' suffering on public buses and decrease the number of private vehicles on the road. However, meeting advanced service quality standards is impossible without increasing public bus fares and costs or relying on government subsidies [1]. In addition, meeting the commu-

ters' satisfaction level through offering a better service quality is the only way by which the public bus service providers or the government can enhance the commuters' willingness to pay (WTP).

The present study attempts to estimate the commuter's willingness-to-pay for improving the service quality level of public buses in Dhaka city. Another aim of this study is to find out the most influential service quality features for which the commuters' willingness to pay. This study will go a step further by discovering the factors that have an influence on the commuters' WTP.

The rest of the paper is organized as follows. In section 2, a literature review specifying the major concerns of this paper, *i.e.*, "public bus service quality level in Dhaka city", "willingness to pay for measuring services", and "stated preference with direct survey as the tool to estimate WTP" is highlighted. Section 3 discusses the methodology of research, including the questionnaire design and data analysis plan. Section 4 highlighted the results and discussion of the findings. Finally Section 5 summarizes the major findings.

2. Literature Review

2.1. Public Bus Service Quality in Dhaka City

The transportation system of Dhaka Metropolitan City (DMC) is predominantly road-based and covers a total area of about 1530 square kilometers [14]. Every day, approximately 1.9 million passengers travel by bus [15], yet the operators and government fail to offer an average service to the commuters. Many researchers investigated the quality of service provided by public buses in Dhaka city, and unfortunately, all of them discovered that the public bus service in Dhaka city is tragic and inconvenient to use. Due to long waiting times, delays on plying, long boarding times, overloading, discomfort, and a long walking distance from the residence or workplace to bus stoppages, current bus services are inefficient, unproductive, and unsafe [16] [17] [18]. Apart from all that, a female commuter has to face some specific gender-based harassment on public transport. Groping, stalking, Eve-teasing, intentional physical touch by fellow male passengers and conductor, and other verbal or gestural abuse are examples of gender-based harassment that a woman encounters on a daily basis [19]. However, the public bus service quality in Dhaka city is predominantly low due to the lack of proper Crime Prevention through Environmental Design (CPTED) facilities, lack of safety, shortage of buses, overcrowding, misbehavior of the bus drivers and conductors, lack of cleanliness, etc.

2.2. Willingness to Pay to Estimating Service Quality

Willingness to pay (WTP) refers to the maximum amount of money a customer or consumer is willing to spend on a product or service [20]. In general, it is a person's desire and ability to pay for something in order to protect, improve, or form something good [21]. If measured accurately, WTP can become a crucial factor for finding or deciding the ideal price or value to sell a product or service

to the consumer. WTP was previously widely used by environmental economists to value non-traded and non-property-rights goods such as air, forests, water, and wildlife populations [22]. At present, with the increasing population and number of consumers, WTP is used by researchers from a variety of fields or majors for the purposes of policy planning [23]. In order to standardize the country's transportation infrastructure, transportation engineers and policy makers from different areas have been exploring consumers' willingness to pay for different service attributes of transport. [24] decided to investigate commuters' WTP for improving the service quality of intermediate public transportation (IPT) modes by developing a Multinomial Logit Model (MNL) and collecting data through a stated preference survey. They discovered that IPT modes with high service quality, taking into account commuters' safety and comfort, are crucial for the commuters' willingness to pay. A Multiple Regression Model was developed by Nyamaliza [21] to estimate the WTP for improved public transport in Dodoma City, Tanzania. The study explored various factors affecting commuters' willingness-to-pay for improved public transport, such as; travel distance in kilometers, travel time in minutes, monthly income, type of transport used, employment status, respondents' level of education, marital status, age, and gender. Several researchers have explored that household income, occupation, age, and price bid are statistically significant factors that influence commuters' WTP [23] [25] [26]. Chen *et al.* [27] conducted a study in China, collecting data via a stated preference survey and analyzing the data using an ordered logistic model. The findings disclosed the effect of age on WTP and how, keeping those findings in mind, transport as well as the tourist industry can flourish. They found that the older respondents were 1.6 - 2.4 times more likely to spend an extra penny to reduce waiting time for transport than the younger respondents. By adopting the Contingent Valuation Method (CVM), Pujiati *et al.* [28] provide a list of service attributes based on which commuters are more willing to pay, and these are ticket service, rate suitability, conditions, speed and length of waiting for the bus, and the placement and conditions of good stops. Jenatabadi *et al.* [1] came up with a new theoretical approach for measuring WTP accurately. A combination of Fuzzy Analytical Hierarchy Process (F-APH) and the Taguchi method were introduced to assess de-biased WTP and acquire a better understanding of the factors that stimulate public transport users to be willing to pay for the fare.

2.3. Stated Preference Survey as a Tool to Explore WTP

When measured correctly, willingness-to-pay (WTP) can help an operator understand the utility function of his product or service or how much satisfaction this service can provide to consumers. From time to time, various researchers have established various frameworks of WTP measurement methods. The effectiveness of services has long been assessed through "customer satisfaction surveys" in which participants express their perceptions of the services under consideration, typically by evaluating them on a scale of one to five [29]. But this

kind of survey has many biases, such as a lengthy questionnaire, no interpretation of the respondents' expectations, and erroneous results. To eliminate this bias while collecting data [3] [27] [29], and used an alternative and more convenient way to capture customer expectations, or importance, through the Stated Preferences (SP) surveys, which actually allow for an indirect capture of the service attributes that are important to customers. One significant benefit of these types of experiments, according to [29], is that hypothetical services can be evaluated by both current and potential users, who can express their opinions even if they do not use the service. As a result, the analyst can both capture potential users' opinions and the service aspects that influence the users' decision to use or not use public transportation [29].

The state reference survey has two categories: direct surveys and indirect surveys. In the direct customer survey, consumers' preferences are the ultimate concern, *i.e.*, how they value a service and what amount they will be willing to pay to consume better services are directly analyzed to assess WTP. It is stated in [30] that 76% of the surveyed firms use a direct approach due to its obvious advantages. A direct approach has three major advantages over any other measurement methods of WTP, and these are: it is simple and very easy to implement, especially in the case of data collection and analysis; it is also very budget-friendly and less time-consuming [31].

3. Methodology

3.1. Sampling Techniques and Data Collection

A comprehensive questionnaire survey was conducted with commuters of a public bus at major city Dhaka in Bangladesh. The survey was conducted during working days and holidays in March-April 2022 when users of the public bus services commute to different destinations. A total of 12 service attributes were asked to the respondents for evaluating their willingness-to-pay by considering the quality level and overall satisfaction level and from these 12, 8 service attributes are used to predict the possible improvement of service quality to mitigate the women commuters harassment, safety and security of public bus. To better understand the users.

Sample Size

To determine the sample size of the popularly we have adopted the following equation

$$\text{Sample Size} = 2500 \times N \times (1.96)^2 / \{25 \times (N-1) + 2500 \times (1.96)^2\} \qquad (1)$$

N: Total Population of the desired study area (N = 24,950,381 person)

Confidence coefficient: Z-score = (1.96) for 95% confidence level

The desired sample size is 385 person, which is below the entire 400 respondents who participated in this survey. The respondents are current users and customers of the general public bus companies based within the city, which is ensured by the respective questions.

3.2. Stated Preference Questionnaire

A stated preference survey was conducted to estimate the commuters' willingness-to-pay for the improvement of the existing bus service quality in Dhaka city. The study was carried out in some major points of Dhaka city and got an overall of 400 effective respondents who use public bus as their main mode of transport. Keeping the objectives in mind, the stated preference questionnaire was divided into five sections and included a wide range of questions (socio-demographics, attitudinal, and WTP) in the form of ratings and multiple choices.

3.2.1. Socio-Demographic Questions

In the very first section, the respondents were asked to provide their sociodemographic information, including age, gender, educational qualification, profession, monthly income, and allocation for the monthly travel expenditure for bus. In many similar studies [21] [32] [33], the respondents' demographic information was asked to explore the relationship between the respondents' demographic features and WTP.

3.2.2. Attitudinal Questions

To know the respondents' perceptions on bus service quality and preferences for seeing an improved service, this stated preference questionnaire includes a numerous range of attitudinal questions. In the second section, a set of questions were asked to the respondents in order to find out their perceptions (what, why, how, where, and when) about women's harassment on public buses in Dhaka city. In addition, the respondents' preferred service quality level was asked in the third section. From the related and my previous research, I came up with twelve most influential attributes of bus service quality, and these are 1) comfort level, 2) safety and security level, 3) travel cost, 4) overcrowding, 5) women commuters' harassment, 6) reserved seats for women commuters, 7) board and alighting facilities, 8) behavior of bus staff, 9) cleanliness of bus, 10) ticketing system, 11) fitness of bus, 12) frequency of bus service. The respondents were given a chance to reveal their preferred level of service of these twelve attributes into three level measures, including "same as now", "medium", and "high".

3.2.3. WTP Measuring Questions

In the next section, a total of eight questions were asked of the respondents in order to explore the most influential service quality features for which they are willing to pay. After considering the related literature and the authors' previous research, the author proposed eight elementary service quality features and asked the commuters whether or not they felt the necessity of these improved facilities on public buses. Table 1 shows the list of improved service quality features.

Later, a dichotomous (Yes or No) question was asked of the respondents, enquiring whether or not they were willing to pay extra fare for public buses with these types of improved facilities. Finally, depending on the answer, the survey

Table 1. List of improved service quality features.

Improved service facilities	Description
A separate door for male and female passengers.	If "Yes" = 1 and if "No" = 2
A separate seat arrangement for male and female passengers.	If "Yes" = 1 and if "No" = 2
CCTV camera and GPS tracker inside bus.	If "Yes" = 1 and if "No" = 2
Fare collected inside the bus using ticketing machine.	If "Yes" = 1 and if "No" = 2
No standing passengers are allowed.	If "Yes" = 1 and if "No" = 2
Setup possible nearest bus stop from the passengers' house.	If "Yes" = 1 and if "No" = 2
Provide special security for female passengers at bus.	If "Yes" = 1 and if "No" = 2
Provide special security service bus for woman commuters at off-peak periods and after 10.00 pm.	If "Yes" = 1 and if "No" = 2

inquired how much extra fare they were willing to let go from their pockets for the improvement of public bus service in Dhaka city. In 2021, bus fares in Bangladesh were raised by 27%, and since then, city buses have been charged BDT 2.15 per kilometer [34] Keeping these considerations in mind, respondents were given five options: "not willing to pay extra fare", "willing to pay BDT 2.50 per km", "willing to pay BDT 3.00 per km", "willing to pay BDT 3.50 per km", and "willing to pay more than 4.00 BDT per km".

3.3. Data Analysis

3.3.1. Descriptive Analysis
A descriptive and regression analyses have been conducted using IBM SPSS Statistics 26. The analysis was divided into three steps. The first step was to analyze the respondents' demographic features by highlighting frequencies and percentages. This step also includes the question of whether the current bus service quality is satisfactory to the respondents. In addition, similar statistical descriptive analyses were conducted to analyze the responses to the second and third sections of the questionnaire.

3.3.2. Regression Analysis
In the next two steps, two types of logistic regression models were run in order to meet the research objectives. Logistic regression is a versatile statistical modeling technique that is widely used to analyze response data and establish relationships between binary or multilevel categorical variables, especially those which are not continuous or normally distributed [35]. In the first phase, a binary logistic model was run in order to find out the respondents' preferred improved service features. The respondents' willingness to pay (No = 0; Yes = 1) was considered as the dependent variable, whereas the eight improved service quality features were the independent variables. While analyzing the data, a 95% confidence interval as well as the Hosmer-Lemeshow goodness-of-fit was used. The Hosmer and Lemeshow statistics are one of the most reliable tests of model fit for binary logistic models [36].

Lastly, an ordered logistic model was used to explore the most influential factors that are responsible for the amount the respondents are willing to pay. So, how much extra money respondents were willing to pay for better service quality was designated as a dependent variable, while gender, age, monthly income, and educational qualification were designated as independent variables. The ordinal logistic regression was modeled through the Polytomous Universal Model Procedure, or PLUM procedure.

## 4. Results and Discussion

4.1. Sociodemographic Results

A total of 400 public bus commuters in Dhaka city were selected as the subjects of the study. Table 2 shows the profile of the respondents' sociodemographic information as well as highlights whether or not they are satisfied with the present bus service quality. Out of 400 respondents, 54.2% were male and 45.8% were female. It indicates that the frequency of male and female respondents in this study is almost equal. Most of the respondents in this study belong to the category of 30 - 40 years of age, and the percentage for that is almost 43.75. The demographic results show that most of the respondents are higher educated, *i.e.*, out of 400 respondents, 227 are graduated and 119 are postgraduate. A total of 203 respondents, or 50.75%, are service holders by profession, and 110, or 27.5%, are businessmen. A major group of the respondents do not belong to the higher income group. Only about 12% of respondents to this survey earn between 40,000 and 50,000 BDT (Bangladeshi taka), with only 1.5 percent earning more than 50,000 taka. Respondents' allocation for monthly travel expenditure is also very poor, *i.e.*, only 6.75% of respondents spent more than 30% of their monthly income on travel. Moreover, a majority of respondents (40.5%) travelled 10 - 15 km per day, whereas the number of people who travelled 15 - 20 km was 119. Later, respondents' satisfaction with the current public bus service in Dhaka city was measured. Table 2 shows that almost 333 out of 400 respondents said that they are not satisfied with the quality of bus service.

4.2. Respondents' Opinions on Women Commuters' Harassment on Bus

In general, Figure 1 shows that 94% of the respondents think that women commuters are harassed while travelling on public buses. Previously, numerous researchers presented the actual scenarios of bus conditions for female passengers. In short, at present, public bus service quality is a kind of dystopia for female passengers. Most of the respondents of this study, as shown in Figure 2 think that it's the lack of service, planning, and policies that's the ultimate reason for female passengers' insecurity on public buses. The passengers already had a negative view towards public buses, and according to Figure 3, (89%) of them considered that overcrowding on public buses intensifies the present poor condition. From Figure 4, it is clearly visible that while answering what they think,

Table 2. Socio-demographic features of the respondents.

Variable	Category	Frequency	Percentage
Gender	Male	217	54.2
	Female	183	45.8
Age	20 - 30	39	9.75
	30 - 40	175	43.75
	40 - 50	123	30.75
	50 - 60	62	15.5
	Above 60	1	0.25
Education	SSC	6	1.5
	HSC	48	12
	Graduate	227	56.75
	Postgraduate	119	29.75
	Student	58	14.5
Profession	Service holder	203	50.75
	Businessman	110	27.5
	Others	29	7.25
Monthly income	Below 10,000 BDT	48	12
	10,000 - 20,000	69	17.25
	20,000 - 30,000	128	32
	30,000 - 40,000	101	25.25
	40,000 - 50,000	48	12
	Above 50,000	6	1.5
Allocation for monthly expenditure for bus	1% - 10%	103	25.75
	11% - 20%	168	42
	21% - 30%	102	25.5
	Above 30%	27	6.75
Is the present bus service quality in satisfied condition to you	No	333	83.25
	Yes	67	16.75
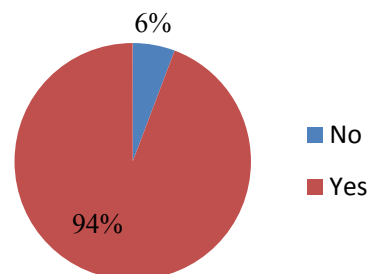
Figure 1. Do you think the woman commuters are harassed while traveling on public bus?
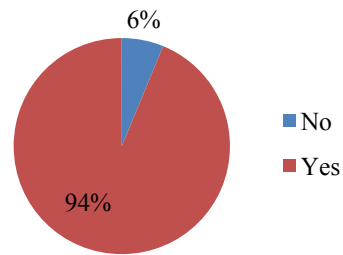
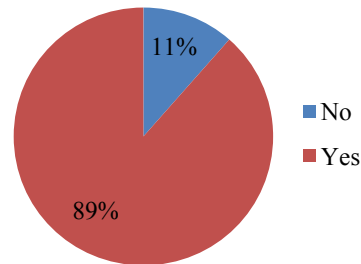**Figure 2.** Woman commuters are harassed for lack of service, planning, and policies.

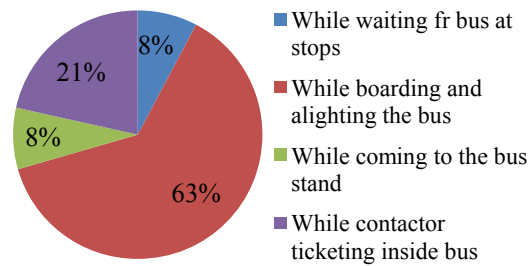**Figure 3.** Overcrowding is the major difficulty to use the bus.

Figure 4. While the women commuters feel are mostly harassed?

the female commuters are mostly harassed, about 63% answered that female commuters are mostly harassed while boarding and alighting the buses. On the other hand, to 21% of respondents, it's when the contractors tickets inside the bus. However, almost 8% respondents respectively, considered that female passengers are mostly harassed while they are coming to the bus stand and while they are waiting for a bus at the bus stop. **Figure 5** shows, however, that nearly 76% of commuters agreed that female passengers are harassed inside buses and 24% of them respond that women are mostly harassed at bus stop. Moreover, **Figure 6** gives us a clear picture of how the majority (93%) of total respondents think public buses in Dhaka city have no implement of CPTED (crime prevention through environmental design). Well-planned and well-designed transport can mitigate the number of crimes, but in Bangladesh, transport infrastructure is so poor that it results in the most harassment. **Figure 7** represents how 67% of respondents believed it's the male co-passengers by whom female passengers are mostly harassed. On the other hand, 33% of respondents viewed female passengers as the most harassed by bus staff. According to **Figure 8**, 80% of total respondents said women commuters feel unsafe and insecure inside buses, while
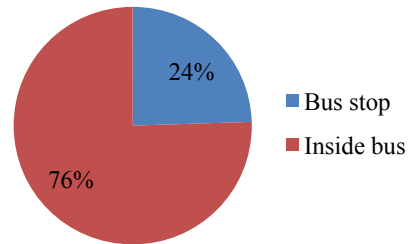
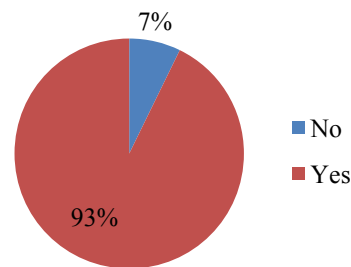**Figure 5.** What do you think where they are mostly harassed?

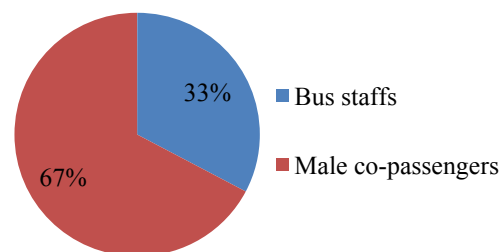**Figure 6.** The interior design of bus has no implement of CPTED.

Figure 7. The woman commuters are harassed by whom you think.
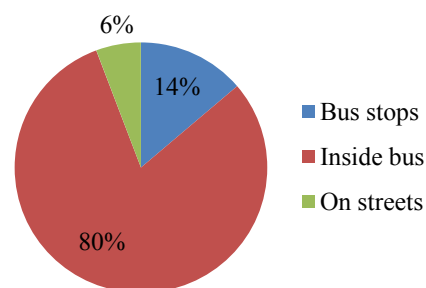
Figure 8. What do you think where they are mostly unsafe and insecure?

14% and 8% said women feel insecure at bus stops and on the street, respectively. Lastly (shown in **Figure 9**), when answering, a majority (47%) of the respondents agreed that female passengers are mostly unsafe between 9.00 and 10.00 pm. Following this, 42% responded that female passengers feel unsafe between 10.00 and 11.00 pm.

4.3. Respondents' Preferred Service Quality Level

Respondents were asked to reveal their expected service quality level for the
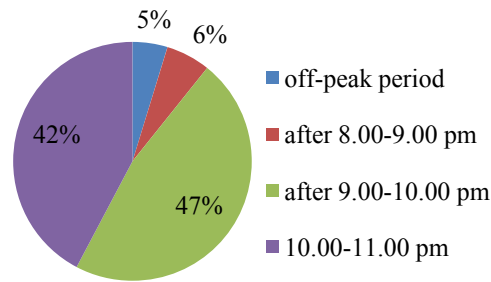
Figure 9. When women commuters are mostly harassed?

twelve most influential attributes they want to experience in the future while traveling by public bus in Dhaka city. Table 3 shows the percentages of the respondents' expected service quality level based on the twelve attributes. The most expected "high" level of service is in boarding and alighting facilities, as respondents prefer a "high" level of service in boarding and alighting facilities. The second highly preferred attribute is the behavior of bus staff. The commuters preferred a "high" level of professionalism from the bus staff. The respondents expected the same high level of service from the two attributes, namely women commuters' harassment and the fitness of the bus. On average, 5.5% and 11.5% of respondents expected "same as now" and "medium" level of service for the formal attribute. On the other hand, for the latter attribute, there were respectively 0.5% and 16.5% of responses for "same as now" and "medium" level of service.

Furthermore, the least three "high" preferred services are, in order, travel cost, comfort, and overcrowding mitigation. The respondents felt that an improved bus service can be assured if the authorities at least ensure a "medium" level of service quality for these three attributes, whereas a great concern should be on the mostly high-level preferred service attributes for providing better service quality.

4.4. Commuters' Preference and Improved Service Quality Facilities

Public transport services in Bangladesh, especially in its capital Dhaka, need to be improved. Apart from implying better policies and observation, a better service quality that ensures women's safety and comfort is needed to improve the present state. As shown in Figure 10, the majority of respondents, *i.e.*, almost 85% of total respondents, revealed their willingness to pay for the improvement of public bus service quality in Dhaka city, while 15% of respondents didn't agree to pay more. A binary logistic model was run to find out the most influential service features the respondents would like to pay for. Table 4 presents the result of the binary logistic model.

In comparison to the null model, the model was statistically significant x^2 (8, $N = 400$) = 65.010, p < 0.001, indicating that the model has great explanatory power in addressing the most influential service facilities for which the respondents

Table 3. Respondents' preferred service quality for most influential service attributes.

Most influential service quality attributes	Service quality level (%)		
	Same as now	Medium	High
Comfort	12.8	66.5	20.8
Safety and security	8.8	10.5	80.8
Travel cost	12.8	71	16.3
Mitigating overcrowding	0.8	32	67.3
Women commuters harassment	5.5	11.5	83
Reserved seat for women commuters	7.2	17.5	75.3
Boarding and alighting facilities	0.8	11	88.3
Behavior of bus staffs	4.8	10.8	84.5
Cleanness of bus	0.5	22.8	76.8
Ticketing system	7.2	22	70.8
Fitness of bus	0.5	16.5	83
Frequency of bus service	0.8	16.5	82.8

Table 4. Results of binary logistic model.

Service quality features	B	p	Exp (B)	95% Confidence Interval	
				Lower Bound	Upper Bound
A separate door for male and female passengers	−18.960	1.000	0.000	0.000	
A separate seat arrangement for male and female passengers	−1.281	0.127	0.278	0.054	1.438
CCTV camera and GPS tracker inside bus.	0.594	0.594	1.812	0.203	16.145
Fare collected inside the bus using ticketing machine	0.172	0.870	1.187	0.151	9.351
No standing passengers are allowed.	−0.762	0.406	0.467	0.077	2.814
Setup possible nearest bus stop from the passengers' house.	−0.815	0.354	0.443	0.079	2.484
Provide special security for female passengers at bus.	−1.629	0.054	0.196	0.037	1.028
Provide special security service bus for woman commuters at off-peak periods and after 10.00 pm.	−0.791	0.752	0.453	0.003	61.113
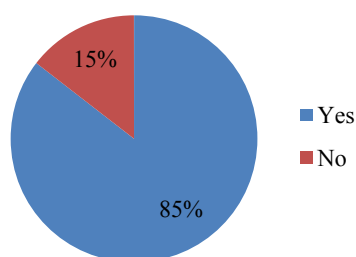
Figure 10. Are you willingness to pay for better service quality of public bus?

are willing to pay. The model correctly identified 89.5 percent of the instances and explained between 15% (Cox & Snell R square) and 26.6% (Nagelkerke R

square) of the variation in the dependent variable. The Hosmer and Lemeshow test result is non-significant (0.152) or p > 0.05, which in fact shows that the model fits the data well.

Table 4 shows that all the coefficients of improved service quality features are negative except for two features, named "CCTV camera and GPS tracker inside buses" and "fare collected inside bus using ticketing machine". For "CCTV camera and GPS tracker inside buses," almost 48.5%, of total male respondents, said "yes," while the number of females with "yes" responses was 43.5%. Males and females, admitted that fares should be collected inside the bus using a ticketing machine in order to reduce women's harassment inside the bus. This actually means that these two service features have a greater impact on the respondents' willingness to pay for better service quality, or in other words, the respondents' like to see these types of improved features in public buses more than the rest of the six attributes. The p-value for these service features is all non-significant, suggesting a non-zero correlation between the dependent and independent variables. Nevertheless, when asked about the preference, most of the respondents said "yes" to these improved service facilities and agreed to use this type of public bus in the future. However, the six improved service facilities after the two most influential service features are respectively described as follows. "No standing passengers are allowed", with 48% and 44.25% of male and female passengers who said "yes" to this improved feature. Provide a special security service bus for female commuters during off-peak hours, to which 53.5% of males and 45.75% of females said "yes", with no female and only 3 male respondents saying "no." The next important feature is "Setup possible nearest bus stop", and the number of male and female respondents who made "yes" responses to this feature was respectively 48.75% and 44%. Furthermore, the rest of the three most influential service features are "Separate seat arrangement for male and female", which received 48.5% and 43.5% positive responses from male and female respondents; "Provide special security for female passengers on bus", which received 49% and 44% positive responses from male and female respondents; and finally "A separate door for male and female passengers", which received 54% and 45.75% positive responses from male and female respondents.

4.5. Factors Affecting Commuters' WTP Amount

The amounts respondents were willing to pay were ordinal in nature. As a result, an ordinal logistic regression model was developed to determine which factors were influencing the number of respondents who agreed to let go in exchange for better service quality. The regression model offers a satisfactory level of significance and a high explanatory power of the predicators over the baseline intercept-only model. Table 5 presents the result of the ordinal logistic regression model.

The result shows that respondents' gender and age range have nothing to do with the amount they are willing to pay, whereas the respondents' WTP amount

Table 5. Results of ordinal logistic model.

Variables	B	SE	Wald	df	p	95% confidence Interval	
						Lower Bound	Upper Bound
Gender (1)	−0.210	0.220	0.914	1	0.339	−0.641	0.221
Gender (2)	0ᵃ			0			
Age Range (1)	−0.20	2.277	0.000	1	0.993	−4.483	4.443
Age Range (2)	0.092	2.240	0.002	1	0.967	−4.298	4.481
Age Range (3)	0.101	2.233	0.002	1	0.964	−4.275	4.478
Age Rage (4)	−0.808	2.241	0.130	1	0.718	−5.199	3.584
Age Range (5)	0ᵃ			0			
Educational qualification (1)	0.127	0.893	0.020	1	0.887	−1.624	1.877
Educational qualification (2)	−0.353	0.419	0.708	1	0.400	−1.175	0.469
Educational qualification (3)	1.034	0.300	11.898	1	0.001	0.446	1.621
Educational qualification (4)	0ᵃ			0			
Salary range (1)	−5.718	1.001	32.610	1	0.000	−7.680	−3.755
Salary range (2)	−4.237	0.939	20.340	1	0.000	−6.078	−2.396
Salary range (3)	−3.561	0.895	15.836	1	0.000	−5.315	−1.807
Salary range (4)	−3.186	0.886	12.945	1	0.000	−4.922	−1.451
Salary range (6)	−2.055	0.894	5.283	1	0.022	−3.807	−0.303
Salary range (7)	0ᵃ			0			

OLR results: −2 Log-likelihood = 435.942. Chi-Square test (with 13 degrees of freedom) = 130.947; the corresponding p-value is $p < 0.0001$. Goodness of fit test (Deviance = 0.580 and Pearson = 0.000). Nagelkerke R^2 = 0.310.

is highly affected by their monthly income. The negative coefficient of all income groups prior to the reference category (*i.e.*, the highest income group) suggests that all of those income groups are less likely to pay WTP > 4.00 BDT than the highest income group. The coefficient of the lowest income group is (−5.718), indicating their unwillingness to pay more compared to the second or third income group. The more a respondent's income raises the more likelihood he or she has of paying WTP > 2.50 BDT. However, the respondents' likelihood of paying WTP > 4.00 BDT or WTP 2.50 BDT isn't influenced by their highest education level. The positive coefficient (1.034) of education level (3) suggests the graduate respondents are more likely to pay more than the reference group, which is the highest educational group. The negative coefficient (−0.353) of the second education group indicates they are less likely to pay more than the reference category. On the other hand, the positive coefficient (0.127) of the lowest education group means that they are more likely to pay more than the reference category. Overall, respondents' highest education does not indicate that they are willing to pay a premium for higher service quality. Previous studies like [21] [32], and [33] found some socio-demographic features of the respondents that have a great impact on the respondents' WTP for the targeted service or prod-

ucts. [21] attempted to value WTP for improved public transport in Dodoma, Tanzania, and found that the commuters' education level, marital status, age, monthly income, and employment status were all responsible for affecting the commuters' willingness to pay. However, compared with the results of the [21] and [37], the present study shows that it's the commuters' monthly income that is affecting their WTP for an improved service quality for public buses in Dhaka city.

5. Conclusions

This study aimed to find out commuters' willingness to pay for better service quality on public buses in Dhaka. The present condition of public buses in Dhaka city is a kind of dystopia due to overcrowding, harassment, poor infrastructure of buses, insufficient service, etc. Women are the worst sufferers of these insufficient and poor services. The study found that most of the respondents believe that women are harassed inside buses by their male co-passengers. Also, a significant number of respondents agreed with the fact that it is after 9.00 pm when most female passengers feel unsafe and insecure travelling by bus.

When asked about the preferred service quality level for the most influential attributes, most of them expressed a high level of service for each of the attributes.

In fact, 85% of respondents showed their interest in paying an extra fare in order to enjoy comfort and a better level of service on public buses in Dhaka city. To mitigate the women's harassment on public buses and offer a safe and comfortable travel experience, the study found some significant service quality facilities, and among them, CCTV cameras and GPS inside the bus and fare collected inside the bus through ticketing machines are the most influential ones that have the likelihood to drive the commuters' willingness to pay.

Moreover, the result of the ordinal logistic model shows that it is the respondents' monthly income that affects the respondents' willingness to pay. Respondents with 10,000 BDT or less in monthly income are less likely to show WTP > 2.50 than respondents with 10,000 BDT or more in monthly income. Unlike relative researchers, this study found that the respondents' gender, age, as well as education level were not affecting factors of their WTP.

The study has some limitations, and one of the major limitations is its sample size. The sample this paper used was 400, which is quite poor when compared with the 22.3 million people living in this city. The survey's small sample size makes it impossible to accurately standardize the perceptions and preferences of a diverse range of residents. Further, a limitation of the adopted methodology is that it is not statistically sufficient at all to estimate WTP.

The recommendations of this study include, while working for female safety and security on public transport, technology or technology-based features should be more welcomed by the authorities, increasing transport fares for the welfare of commuters might not be successful without considering the commuters' socio-demographic information. However, this study will give the authorities as

well as policy makers a chance to give emphasis to the preferences of the commuters and provide services that will ensure the commuters' comfort, security, and satisfaction.

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Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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