

COMMUTERS' WILLINGNESS TO PAY FOR COMFORT LEVEL IMPROVEMENT OF PUBLIC BUS TRANSPORT SERVICE IN KANDY

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ABSTRACT - Due to higher travel time, higher waiting time, and low comfort level in public transportation modes, commuters have been shifting to private transport modes causing an increase in traffic congestion, accidents, and environmental issues. Therefore, improving the comfortability of the public bus transport system is very important since it is one of the key factors affecting the mode choice of commuters. This study is set to identify the Willingness to Pay (WTP) ability of commuters for an improved comfortable bus service. The data for the study was collected through a questionnaire survey in Kandy, which is the second busiest city in Sri Lanka. Binary Logistic Regression was used to identify the factors affecting the WTP of the commuters and the WTP value. According to the results, it was identified that the frequency of bus usage is a significant factor which affects the WTP of a commuter. Furthermore, it has been identified that a daily commuter is willing to pay 1.5 times the bus fare while the rare users and private vehicle users are willing to pay about 2 times the current bus fare for a comfortable bus service.

Keywords: Willingness to Pay, Public Transportation, Binary Logistic Regression

1. INTRODUCTION

To provide adequate public transport service, it is essential to understand the gap between commuters' expectations and the service they receive. It has been identified that over 90% of the road space is used by private and hired vehicles however served only 35% of the total travel demand [1].

In Kandy, Sri Lanka, nearly 300,300 passengers are using the public bus transport service. Passenger queues can often be seen in Kandy city due to the lack of adequate space which creates significant safety risks for pedestrians [2]. Limited road infrastructure, conflicting land use, the poor orientation of bus routing, terminal and stops, inadequate by-pass roads are identified as some of the major transport-related issues in Kandy Sri Lanka [3]. Therefore, to minimize these problems, improving the public transport system in Kandy Sri Lanka becomes more and more important.

In the case of public transport, WTP is the average highest fare that travellers are willing to pay for using the system [4]. Numerous studies have been carried out to evaluate the passengers' WTP for improvements in the bus service. Bachok & Ponrahoo studied the WTP of passengers in Malaysia to model it for an increased fare rate for specific bus improvement areas [5]. Despite the negative response from the responders' WTP (lower than 6%), authors were able to identify passengers' expectations on key aspects of the bus transport service improvements. Similar findings have been discovered by Eboli & Mazzulla [6]. In their study, respondents were made to choose what improvements to be made for an increased rate and the study suggests that users are willing to pay an increase of the ticket equal to 44% for an increased frequency (a bus at every 15 minutes) of the bus service. Bachok & Ponrahoo have used SPSS software to conduct a Chi-Square analysis to test the WTP of the passengers for latent variables (comfort and safety) and travel-time-related variables [5]. Another attempt to compare WTP for additional fare for an increased frequency has been conducted in the same manner. The results indicate that there is a significant relationship between fare rate increase and bus frequency. Also, authors have attempted to model the WTP for an increased fare. For that, a simple linear regression has been carried out.

Binary Logistic Regression analysis has been utilized by several researchers to calculate WTP values. Suanmali et al., studied the factors affecting the WTP for Solar Home Systems in Thailand [7]. A survey was developed and contains questions about demographic information, environmental awareness toward the use of renewable energy, and solar home energy system (SHS). Binary Logistic Regression analysis was employed to identify significant factors affecting the WTP for SHS. Putri & Widyastuti has also used Binary Logistic Regression to study the WTP for a high-speed train between Bandung and Jakarta cities [8]. Handayani et al., studied the toll fare sensitivity of the Solo-Ngawi toll road based on WTP [9]. The analysis was done with logit and probit models. Based on the analysis, it is found that the effect of fare change on the amount of WTP on the binomial logit model is more sensitive than the probit model on the same travel conditions.

One of the major issues identified in the public transport system in Kandy Sri Lanka is comfortability. Clean bus interior, comfortable seats and comfortable and clean bus stop facilities are some of the key expectations of bus passengers. But, with the increase in the comfortability of the service, the operational cost of the bus service is also increasing. Therefore, this study is set to examine the WTP of bus passengers for the possible improvements of the bus transport system in Kandy, Sri Lanka.

2. METHODOLOGY

WTP value of the passengers for the possible improvements of the bus service is collected through a questionnaire survey. Participants were randomly selected and all of them are more than or equal to 16 years old. The questionnaire consists of two main parts. The first part was arranged to gather the socio-demographic characteristics of the passengers. The second part of the questionnaire focused on gathering the passengers' opinions about the bus service and their WTP value for a given comfortable service using a five-point Likert scale. The proposed comfortable bus service is introduced to the respondent using a set of figures and the WTP amount with respect to the current service provider value of 100 LKR is obtained. A sample size of 1672 respondents was considered for the analysis.

3. RESULTS AND DISCUSSION

Binary Logistic Regression is used for the data analysis by taking the ability to pay (yes or no) as the dependent variable using the SPSS statistical software. Twelve independent variables were considered for the initial analysis. Among these twelve factors, two factors were identified as the significant factors affecting the WTP of commuters as travel frequency in buses and the WTP value while the other 10 factors were identified as non-significant factors. Therefore, the analysis was performed for the identified significant factors. Table 1 shows the model summary of the analysis.

Table 1: Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	676.393 ^a	0.506	0.735

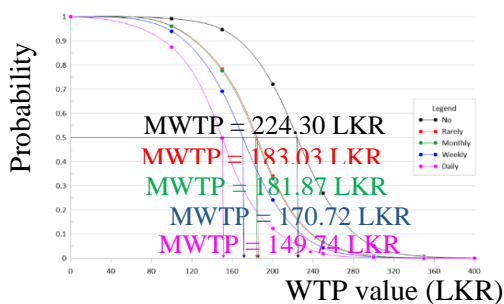


Figure 1: Probability Curves

According to Table 1, the Nagelkerke R Square value which is an adjusted version of the Cox & Snell R Square value is obtained as 0.735. This implements that a 73.5% change in the criterion variables can be accounted for the predictor variables in the model. The dependent variable (Y) of the model equation is logit (P), and it gives relevant probability values for each frequency level and WTP value. The probability curves for each frequency level are plotted using and shown in Figure 1.

From the above probability curves, the Median

Willingness To Pay (MWTP) value was calculated. MWTP is defined as the cost at which the respondents are likely to answer "yes" or "no". If "yes" and "no" are equally likely, then $P(\text{yes}) = 1 - P(\text{no}) = 0.5$.

4. CONCLUSION

This study investigates the Willingness-To-Pay (WTP) value of bus passengers for an improved bus service. Binary logistic regression was used for the data analysis by considering the payability of commuters (yes or no) as the dependent variable. Frequency of bus usage and the WTP value were identified as the significant factors affecting the payability of the commuters.

According to the results of the binary logistic regression, it has been identified that the WTP value of the commuters is inversely proportional to the travel frequency (in buses) which suggests that the commuters who use the bus service less frequently are willing to pay more for an improved service than the daily commuters. The travel frequency (in buses) of commuters was identified under five levels as no, rarely, monthly, weekly and daily. The WTP values for these five levels instead of 100 LKR in the current service were identified as 224.30, 183.03, 181.87, 170.72 and 149.74 LKR respectively. These results suggest that the commuters are willing to pay more for an improved bus service and many commuters who are using private vehicles currently are willing to use an improved public bus service. The results of the study can be used by the relevant authorities to improve the bus service in Kandy, Sri Lanka. Since rarely bus users are willing to pay about twice of the current cost, the luxury bus service can be improved and expanded within the district. Most of the commuters are willing to pay a cost of 1.5 times of the current cost, a semi-luxury bus service can be introduced in the district to attract more commuters towards the bus service.

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