PASSENGER'S SATISFACTION WITH PUBLIC BUS TRANSPORT SERVICES IN GHANA: A CASE STUDY OF KUMASI–ACCRA ROUTE

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Abstract

Road transport forms part of the daily activities of individuals and it is the principal mode of transport in Ghana. In many parts of the world, individuals tend to use their private vehicles due to lack of satisfaction they derive from the services of public transport. In this paper, passengers satisfaction with public transport services in Ghana has been investigated using binary logistic regression model. Among the sampled passengers, the results indicate that 15%, 63.2%, 20.8% and 1% believed that the overall service quality of public transport is excellent, good, moderate and poor respectively. From the estimated binary logit model, passengers rating for overall service quality tend to increase when they are satisfied with service components such as fare structure (*OR*=1.897; 95%*CI*=1.08-3.33), crime rate at bus station (*OR*=1.829, 95%*CI*=1.05-3.18) and traffic safety record of the bus (*OR*=4.407; 95%*CI*=2.64-7.36). It was established that, passenger's satisfaction with public transport service is highly influenced by bus traffic safety record. Thus, to retain existing and attract new users, policies relating to passengers safety and comfort as well as fare and control of crime rate at the bus station should be targeted and improved upon. They are the service components that users valued most.

Keywords: Public Transport, Service Quality, Passenger Satisfaction, Binary logit model.

1. INTRODUCTION

Road transport forms part in the day to day activities for most individuals and in Ghana it is the principal mode of transport. A modern transport system which provides high quality of services has been a topical issue in transport modelling literature (Cullinane, 2002; Ebuli and Mazzula, 2007; Ali, 2010; dell'Olio et. al., 2010; Randheer et al. 2011). According to Ali (2010), transport is important for the

survival of the modern society. An effective and efficient system of transport can significantly contribute to human development in a wider perspective.

Urban cities in Ghana increasingly face problems caused by road transport externalities. For example, there is an increasing trend in road traffic crashes, traffic congestion and emission of carbon dioxide. The impact from road traffic congestion, carbon emission and road crashes is significant in time, pollution and economic loses. Part of these problems is as a result of greater number of low occupancy commercial as well as privately owned vehicles in the cities. According to dell'Olio et. al. (2010), an important characteristic of modern society is its preoccupation with promoting sustainable modes of transport to replace the excessive use of the private car in most urban areas.

Despite the vital role that buses play in any urban areas, their services are frequently insufficient to meet demand and the services that are provided mostly suffer from low output (Ali, 2010). In many parts of the world, individuals tend to use their private vehicles due to lack of satisfaction they derive from the services of public transport. For instance, the findings of Cullinane (1992) in an attitudinal survey in UK showed that 41% of private car users would reduce their car usage if public transport became frequently available and reliable. Again, Cullinane (2002) used attitudinal survey based on sampled university students in Hong Kong and found that good public transport can deter car ownership, with 65% of the respondents in the survey stating their unlikelihood of buying a car in the next five years. Improvement in transport system can have a positive effect on land development (Deng and Nelson, 2010). Deng and Nelson further describe that high quality of public transport system can greatly improve the accessibility of its catchment area by shortening time. Ebuli and Mazzula (2007) also comment that an improvement in the supplied service quality can attract further users. Randheer et al. (2011) argue that, in the current scenario of globalization, public transport service needs introspective sensitivity towards the quality of service offered.

Transportation system can be a reliable indicator of economic development. It works as a factor that stimulates economic growth by providing employment, improving the effectiveness and efficiency of other businesses and also contributing to national investment and development. According to Dube et al. (2011), public transport plays a social role in the urban environment: it improves access to work places and service infrastructure and at the same time, reduces travel expenses. Both public authorities and transport operators are involved in policy formulation and implementation in relation to transport services. Since public authorities and transport operators have different goals, regulation plays an important role, especially, failing competition (Gatta and Marcucci, 2007).

Passengers satisfaction relating to transportation has been studied in many countries. For instance, Friman (2010) examined affective reactions to passenger waiting times relating to public transport and their impact on overall satisfaction with the service in Sweden. Using Analysis of Variance (ANOVA) technique, the study found that overall satisfaction with public transport corresponded with the nature of the waiting time scenario. Chen and Lai (2011) explored the relationships between passenger's behavioral intentions of public transit and the various factors that affect service quality, perceived value, satisfaction and involvement in Taiwan. By applying structural equation modeling, the study found that service attributes such as vehicle safety, facility cleanliness, and complaint handling have significant influences on passenger behavioral intentions. dell'Olio et. al. (2011) also assessed the quality of service desired by public transport users of the city of Santander using multinomial discrete choice models. The study found that waiting time, cleanliness and comfort are the public transport variables that users valued most. Shiftan and Sharaby (2012) assessed the impact of fare integration on travel behavior and transit ridership in the city of Haifa, Israel. Using travel-behavior model, the study found that fare reduction was a significant factor in attracting transit users, encouraged travelers to shift from private cars to buses.

According to Cullinane (2002), if public transport is generally perceived to be good and cheap, it can suppress demand for private cars. To make the quality of services provided by public transport operator more attractive, safe, conducive and affordable to the general public, thereby reducing the number of individual private cars on the road and also to reduce traffic volumes, the present study seeks to determine passengers' satisfaction with the services provided by the public bus transport operators in Ghana. The findings may provide useful information to policy makers for the development of actionable plan to improve the quality of services provided so as to retain customers and avoid operation losses by public transport operators. According to Awasthi et. al. (2011), managing service quality is vital to retain customer satisfaction and augment revenues for any business organization. Also, understanding the behavioral intentions of public transport passengers is important, because, customer loyalty is seen as a prime determinant of long-term financial performance (Chen and Lai, 2011).

The remaining part of this paper is organized as follows: Section 2 describes the approach of data collection, and methods employed in this paper to analyse the data. The empirical results and discussion are presented in Section 3. The section 4 provides the concluding remarks.

2. METHODOLOGY

A cross-sectional survey using a structured questionnaire was undertaken to collect primary data from passengers who have ever travelled from Kumasi to Accra by public transport within the last six (6)

months. A sample of five-hundred (500) passengers was randomly interviewed at designated bus stations to obtain information about their satisfaction with public transport services. The passengers were first asked to provide their socioeconomic data and then attributes related to the service quality of public transport. Among the related service attributes included the fare structure; waiting time for bus before departure; announcement and information on services; schedule adherence; cleanliness of the bus station; cleanliness of bus interior/exterior; availability of shelters; comfortability of bus seats; convenience; bus driver's/conductor's behaviour; crime rate at the bus station; frequency of bus breakdown and bus traffic safety record. For each category, the passengers were asked to rate their satisfaction level on these service components on a five-point scale (i.e. from very dissatisfied to very satisfied). Due to low frequencies recorded for some categories, the five-point scale was later reduced to a three-point scale (i.e. dissatisfied, moderate and satisfied) and then to a two-point scale (satisfied or otherwise) for the logistic regression analysis. The passengers also rated the overall service quality of public transport on a four point scale (i.e. from poor to excellent). The four point scale was later collapsed to two point scale during modeling.

The surveys were conducted from May 24th through June 4th 2012 at a cluster of public transport terminals in Kumasi Metropolis which is made up of Neoplan and M-Plaza stations. Out of the 500 questionnaire administered, eight (8) were discarded for incompleteness; hence the response rate was 98.4%. To explain the effect of passengers satisfaction level of individual service component on the overall service quality rating, the study employs binary logistic regression model. This type of model was used in this study to examine how several attributes relating to public transport services are associated with the passenger's rating for overall service quality.

2.1. Binary Logistic Regression

The Binary Logistic Regression (BLR) model is one of the most commonly used statistical techniques for the analysis of binary categorical response variables (Nelder and Wedderburn, 1972; Agresti, 2007). This type of model is a member of the family of models known as generalized linear model. The model predict the probability of a passenger to rate the overall service quality to be good, condition on the level of satisfaction of the individual service components provided by public transport operators.

The model assumes a binomial distribution for the binary dependent variable and a logit link function. If binary values 1 and 0 are used to represent passengers overall good and not-good respectively, then the binary logistic regression model which is commonly known as binary logit model is defined as (Agresti, 2007):

$$\log it(y) = \ln\left[\frac{P(Y=1)}{1-P(Y=1)}\right] = \alpha + X\beta \qquad (1)$$

where P(Y=1) describe the probability of a passenger rating the overall service as being good whiles [1-P(Y=1)] represent the probability of a passenger rating the overall service as not-good given the satisfaction level of the individual service components. This probability falls between 0 and 1 ($0 \leq \pi \leq 1$) for all possible independent variables. Also, α and β represent the intercept and a vector of slope coefficients respectively whiles X is a vector of explanatory variables representing the satisfaction level for individual service component. The parameters in the model can be estimated using maximum likelihood estimation method. The estimated model can be evaluated as done in any other generalized linear model. That is, by testing the significant difference between the null model (restricted model) and the fitted model (unrestricted model) for the data. In addition, the fitted model can be checked for the problem of over/under dispersion. The estimated value of the parameter β describes the effect of the explanatory variable X on the log odds of response Y=1 (Agresti, 2007). In this work, all computerizations were performed using R and STATA software (R Development Core Team, 2011; StataCorp, 2009).

3. EMPIRICAL RESULTS AND DISCUSSION

3.1. Descriptive Statistics

From the analysis, the average use of public transport within the last six (6) months was two (2) times. Also, higher proportion (40%) of the passengers travel by public transport for business purposes. Aside passengers who normally use public transport for school (20%), business (40%) and recreations (12%), most people (28%) also use it when they travel for other purpose like social visits and funeral ceremonies.

Table 1 presents the socioeconomic characteristics of the passengers interviewed stratified by their ratings for the overall service quality of the public transport. In terms of overall service quality, higher proportion of both male and female passengers (79% and 77% respectively) rated the service quality to be good or excellent. There was no significant difference between the ratings of male and female passengers (p=0.106) for service quality. Within the various age groups, passengers who are within the ages of 18 to 30 years form the majority group (62%) of whom 80% rated the overall service quality to be good or excellent. However, over 70% of all the age categories rated the overall service quality to be either good or excellent. With respect to educational attainment, passengers with higher level of

education (Tertiary level) form the majority group (55%) of whom 81% rated the bus service quality to be either good or excellent. Majority of all the educational categories rated the service quality to be good or excellent. Within the marital status category, majority of the passengers (64%) were not married and over 78% of them rated the service quality to be either good or excellent. Student passengers form the majority group (34%) within the occupational status categories and over 80% rated the service quality to be either good or excellent. Similarly, over 78%, passengers with income levels between ¢500 to ¢799 rated the service quality to be either good or excellent. Majority of the passengers from each category rated the overall service quality to be good or excellent.

TABLE 1 - SAMPLE CHARACTERISTICS BY OVERALL SERVICE QUALITY RATINGS

Variable	Overall Service Quality Rating (%)					P-value
	Poor	*Moderate*	*Good*	*Excellent*	*Sample Total*	
Gender						**0.106**
Female	0	23	62	15	200	
Male	1.7	19.2	64	15.1	292	
Age (years)						**0.09**
Below 18	7.7	15.4	46.2	30.8	13	
18 – 30	0.7	19.7	63.9	15.7	305	
31 – 40	1.1	27.6	65.5	5.7	87	
41 – 50	1.9	13.0	64.8	20.4	54	
Above 50	0	27.3	54.5	18.2	33	
Education						**0.144**
Primary or below	1.5	31.3	59.4	7.8	64	
Secondary	1.9	20	62.6	15.5	155	
Tertiary	0.4	18.6	64.5	16.5	273	
Marital						**0.727**
Single	1.0	19.8	62.9	16.3	313	
Married	1.1	22.3	63.7	12.9	179	
Occupation						**0.024**
Student	1.2	17.8	60.9	20.1	169	
Unemployed	3.3	33.3	56.7	6.7	30	
Self-employed	0.6	26.8	62.8	9.8	164	
Employee	0.8	14.0	68.2	17.1	129	
Income (GH¢)						**0.259**
Below 200	2.7	17.9	61.6	17.9	112	
200 – 499	0.7	27.3	60.4	11.5	139	
500 – 799	0	21.4	68.6	10	70	
800 – 999	2.5	17.5	65.0	15.0	40	
1000 and above	0	13.3	68.3	18.3	60	
Journey Type						**0.715**
School	0	18.6	65.6	15.6	97	
Business	0.5	21.5	63.6	14.4	195	
Recreation	1.7	25.4	55.9	16.9	59	
Other	2.2	19.6	64.5	13.8	139	

In general, out of the 492 questionnaire analysed, majority of the passengers (63.2%) rated the service quality of public transport to be good, 20.8% rated it to be moderate, 15% rated it to be excellent and only 1% of the passengers rated it to be poor. The results in general show that, higher proportion of the passengers are satisfied with the overall service quality of public bus transport. To determine the association between passengers characteristics and the rating for overall service quality, a Likelihood Ratio test was performed. The results of the test as displayed by the p-values in Table 1, show significant association between occupational level and overall service quality ratings. On the average, students or employees were more likely to rate the service quality higher than the unemployed or self-employed (83% vrs 70%).

Table 2 displays the summary statistics of passengers satisfaction level with respect to the individual service category related to the public transport services. From the table, it can be seen that majority of the passengers expressed high satisfaction level with regard to individual service components such as waiting time at the terminal for bus, cleanliness of the bus station, cleanliness of the bus interior/exterior, shelter at the bus station, seats on the bus, bus convenience, behaviour of the bus driver and conductor, crime rate at the bus station, bus breakdown frequency and traffic safety record. On the other hand, majority of the passengers expressed moderate satisfaction level for the remaining service components such as fare structure; announcement and information on services as well as schedule adherence. With regard to individual service components, only few passengers (9.8%) expressed dissatisfaction with bus service quality. In general, the results from the table also confirm that passengers are satisfied with services of the public bus transport on the Kumasi–Accra route.

TABLE 2 - PASSENGER'S SATISFACTION LEVEL WITH INDIVIDUAL SERVICE COMPONENT1

Service Component	Satisfaction Level (%)		
	Dissatisfied	Moderate	Satisfied
Affordable fare structure	18.5	**41.1**	40.2
Waiting time for bus at the terminal	22.0	31.5	**46.3**
Announcement and information on services	27.8	41.5	30.1
Schedule adherence	14.6	50.6	34.6
Cleanliness of bus station	6.7	27	**66.1**
Cleanliness of bus interior/exterior	3.3	15.9	**80.3**
Availability of shelter at bus station	8.7	29.5	**61.4**
Comfortable seats on the bus	3.3	14.6	**81.7**
Convenience /Suitability of use	3.9	18.5	**77.6**
Behaviour of the bus driver and conductor	4.9	25.6	**69.3**
Crime rate at bus station (safety)	3.5	25.8	**70.3**
Frequency with which breakdown occurs	5.9	22.4	**71.3**
Good traffic safety record	3.7	23.8	**71.3**

[1] Note: Percentage for missing values are not shown in the table

3.2. Binary Logistic Regression Model Specification

To evaluate the influence of the satisfaction level of individual service component on ratings for overall service quality, the binary logistic regression model was fitted to the data.

Due to low frequencies recorded for some categories, the response variable were grouped into two categories, that is, excellent and good were grouped into one variable whereas moderate and poor also formed another group. The satisfaction level for individual service component was also regrouped generally into two, that is dissatisfied and moderately satisfied were regrouped into one category (dissatisfied) whereas satisfied alone stood as another category.

Stepwise regression with backwards deletion and Akaike Information criterion (AIC) techniques were used in selecting the appropriate explanatory variables to be included in the model.

Table 3 summarizes the maximum likelihood estimates of the fitted binary logit model. The coefficients for all the variables are estimated relative to the selected reference category.

Among the independent variables considered, variables such as fare structure, crime rate at the bus station, and traffic safety record were found to be significant factors that influence passenger rating for overall service quality. Also, occupational status was found to influence passenger rating for overall service quality, hence, the fitted model adjusted for this variable.

To assess the goodness-of-fit of the fitted model, the Likelihood Ratio test was performed to test the null hypothesis that there is no significant difference in log likelihood value between the null (restricted model) and the final model (unrestricted).

From the results as presented in Table 3, we rejected the null hypothesis and conclude that the final model is better than the null model. In addition, the Likelihood Ratio test was performed to assess the problem of over/under dispersion in the binary logit model. From the results as presented in Table 3, we failed to reject the null hypothesis of no over/under dispersion in the fitted model. Hence, we consider the fitted model to be a good fit for the available data.

From the estimated model, it was found that passengers who are satisfied with the fare structure of public transport are about 90% more likely to rate the overall service quality as good as compared to passengers who are dissatisfied with the fare structure (OR=1.897; p=0.026).

This means that when passengers believe that the prices charged by public transport operators is equivalent to the services they provide, they tend to be satisfied with the overall service thereby discouraging them to shift. The result is in agreement with the findings of Shiftan and Sharaby (2012)

that, optimal or low fare structure will not only help to maintain customers but will also improve public transport attractiveness, as well as optimization of revenue and profit.

When the effect of passengers satisfaction level of bus cleanliness on overall service quality rating was examined, it was found that the overall ratings of service quality for passengers who are satisfied with cleanliness of the bus is not significantly different from passengers who are dissatisfied with the bus cleanliness.

The results contradict with the findings of Chen and Lai (2011) that cleanliness significantly influence passengers behaviour intention.

TABLE 3 - PARAMETER ESTIMATES FOR BINARY LOGIT MODEL

Variable	Coefficient	Odds Ratio	P-value	95% CI (OR)
Fare Structure*				
Satisfied	0.6405	1.897	0.026	1.081; 3.331
Cleanliness of Bus Interior/Exterior*				
Satisfied	0.3213	1.379	0.324	0.729; 2.610
Comfortable Seats*				
Satisfied	0.6356	1.888	0.065	0.962; 3.705
Convenience/Suitability of use *				
Satisfied	0.5679	1.765	0.073	0.949; 3.280
Behavior of Bus Driver and Conductor*				
Satisfied	0.4221	1.525	0.123	0.891; 2.609
Crime Rate at Bus Station*				
Satisfied	0.6035	1.829	0.033	1.051; 3.182
Good Traffic Safety Record*				
Satisfied	1.4833	4.407	0.000	2.639; 7.360
Occupational Status				
Unemployed	Ref	---	---	---
Student	1.2999	3.669	0.012	1.331; 10.114
Self-employed	0.6049	1.831	0.224	0.690; 4.859
Employee	1.3359	3.8034	0.014	1.315; 11.004
Intercept	-2.5926	---	0.000	---
Overall Goodness of fit test (Likelihood Ratio test)			0.000	---
Likelihood Ratio test for under dispersion			0.997	---

* Dissatisfied is used as referenced category

Similarly passengers who are satisfied with the comfortability of the seats in the bus are about 89% more likely to rate the overall service quality to be good as compared to passengers who are dissatisfied. This means that passengers' choice for public transport for longer journeys marginally (OR=1.888; p=0.065) depends on the level of comfortability of the seats in the bus. The result is consistent with the findings of dell'Olio et. al. (2011) that public transport users value comfortability when assessing service quality. When the effect of satisfaction level of bus conveniency on overall service quality rating was examined, it was found that passengers who are satisfied with the conveniency of the bus are about 77% more likely to rate the overall service quality to be good as compared to passengers who are dissatisfied with the bus conveniency. The results is marginally

significant (OR=1.765; p=0.07). With respect to crime rate at bus station, passengers who are satisfied with the level of crime rate at the bus station are about 83% more likely to rate the overall service quality as good as compared to passengers who are dissatisfied with the crime rate at the bus station (OR=1.829; p=0.033). Similarly, passengers who are satisfied with the bus traffic safety record are about 340% more likely to rate the overall service quality to be good compared to passengers who are dissatisfied with the bus traffic safety record (OR=4.407; p<0.001). The results support the findings of Chen and Lai (2011) that passenger's satisfaction with public transport services is not guaranteed if the quality of services relating to their safety is not assured. From the specified binary logit model, almost all the significant coefficients for individual service components have positive signs. This indicates that the rating for overall service quality increases when passengers are satisfied with the individual service component. With respect to occupational status, it was found that passengers ratings for overall service quality of public transport is different with respect to the person's status of occupation. For instance, students and employee passengers are more likely to rate the service quality of public transport to be good compared to unemployed passengers respectively. However, there was no significant difference between the ratings of service quality for self-employed and unemployed passengers.

In general, the model depicts that bus traffic safety record is the service segment that highly influence the passengers ratings for overall service quality of public transport.

4. CONCLUSIONS

This study evaluated passengers satisfaction level with the services provided by the public transport operators in Ghana. This research differs from the prior public transport service satisfaction research because of the type of statistical methodology employed for analysing overall service quality. The paper explains the effect of passengers' satisfaction on various services provided by the public transport operators on the overall ratings of service quality of the public transport perceived by the sampled passengers. The results established that over 70% of the passengers rated the overall service quality of the public transport to be either good or excellent. Only 1% of the passengers rated the overall service quality to be poor. Generally, majority of the passengers are satisfied with the services provided by the bus transport operators. The estimated logit model indicates that passengers rating for overall service quality of public transport significantly increases when they are satisfied with the services such as fare level, crime rate at bus station and the traffic safety record of the bus operator. The research strongly pointed that, bus traffic safety record is the most influential service segment and determinant of overall service quality.

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In order to retain existing and attract new users, it is recommended that policies relating to passengers safety and comfort as well as fare and control of crime rate at the bus station should be targeted and improved upon.

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