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EVALUATING PUBLIC BUS TRANSPORTATION SERVICES IN HO CHI MINH CITY, VIETNAM

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ABSTRACT

Research on public transport, especially bus service, is very important since public transport affects all citizens and many social problems like reducing traffic jams, either improving energy efficiency or the environment, and mitigating private vehicles in urban areas. Despite the huge benefits of public transportation, the number of bus users in Ho Chi Minh City, Vietnam has been decreasing recently given the noticeably-deteriorated service quality and lack of satisfaction they derive from the services of public transport. The aim of this paper was to identify the important service elements and ridership's demographic characteristics in determining passenger satisfaction. Ridership's satisfaction with public transport services in Ho Chi Minh City had been investigated using binary logistic regression model. The finding showed that 'availability of seats', 'ease of getting on and off the bus', 'cleanliness of vehicle interior', 'safety on crime while in the bus', 'price/cost charged', 'waiting time at bus station', 'frequency of service', 'information on transport routes and timetables', 'obey road laws', 'behavior of the bus driver and conductor', 'accuracy of announcement and information on services', 'customer care', 'gender' and 'income' were found to be significant factors influencing passenger rating for overall service quality. In addition, the findings had implications for service providers, transport planners and authorities with regard to the implementation of the strategies to upgrade the bus service quality and increase passenger satisfaction.

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1 INTRODUCTION

As a form of public transportation, bus transportation is essential to passenger because it offers chances to travel from one location to the other with ease. Bus transportation improves energy efficiency and the environment. It enhances the quality of life in societies by providing efficient and inexpensive transportation service, improving mobility and mitigating traffic jams on our roads. Bus transportation has been regarded as one of the solutions to traffic in many developing countries (Rohani, 2013), and in Vietnam, especially in Ho Chi Minh City (HCMC), it is true that public bus operation plays an important role in providing transport for commuting passengers.

HCMC is the city which has the highest concentration of population in Vietnam, with over 7.9 million people in 2014 and with an average growth rate of 2.1 % per year, the population of the city is forecasted to rise from 7.8 million to 14.5 million by 2020 (General Statistical Office of HCMC, 2014). Located between the south-eastern region

and south-western region of Vietnam, HCMC is the center of economic, educational and cultural activities. Population growth and urbanization have led to several transport problems. In 2014, HCMC had 5.6 million motorcycles and 547.606 cars. Private transportation including motorcycles accounted for 96.3% of total transportation in HCMC while public transportation only accounted for 3.7% (Le, 2013). The Department of Transport, HCMC have been making efforts in offering public transport services that have resulted in the establishment of HCMC Public Passenger Transport Management and Operation Centre which has been in charge of controlling and operating the 137 bus route (Figure 1). In 2014, approximately 1.62 million people commuted by bus a day which represented 9.9% of the travel demand of local commuters.

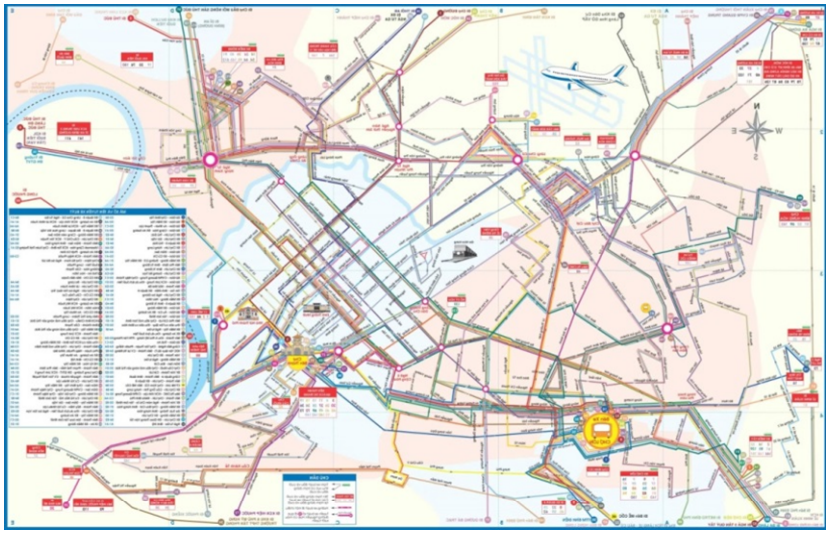

Fig. 1: The bus map in HCMC issued by Ho Chi Minh Public Passenger Transport Management and Operation Centre

Although the number of buses and bus routes has been increasing recently with 107 of a total of 137 bus routes price-subsidized by local government, bus ridership has been decreasing since 2014 owing to service quality deterioration. This problem has hugely affected the quality perceived by the road users, created user resentment and even encouraged them to travel by private vehicles like motorcycle or car, which have caused traffic congestion to get much worse. Public bus transportation is characterized as a service, and the choice of public transport as a mode of travel by travelers in the city is mainly influenced by the quality of bus services (Wall and Mc Donald, 2007). It means that to attract people living in HCMC to use the bus service, its quality has to be upgraded. Bus service quality may be defined using various attributes; however, since the customer is considered to be more important, quality is viewed based on the customer's point of view (Paraskevas, 2001). Therefore, this study focused on the issue on how to improve the quality of the public passenger transport service based on the passenger's perspectives. In order to achieve this objective, this research aimed to identify the service elements and ridership's demographic characteristics which should be prioritized for increasing the passenger satisfaction. The findings of this study would help policy makers, public transportation agencies, and private carriers take proactive actions to increase the passenger satisfaction, improving service quality towards a customer orientation service, and obtaining sustainable transportation development.

2 LITERATURE REVIEW

The quality of transport from the passenger point of view has been widely investigated. According to a research by Transportation Research Board in the USA (1995), some service elements like 'courtesy of bus drivers', 'availability of seats', 'safety from crime after getting off the bus', 'ease of getting on/off the vehicle', and 'service received for the fare paid' should be upgraded. Wen *et al*. (2005) conducted a survey on passengers' willingness to use urban bus transport and the findings were that 'bus interior cleanliness', 'temperature', 'noise', 'seats comfort' had been proved to impact on passenger intention. In Greece, Kostakis and Pandelis (2009) found that 'safety', 'service inside the bus', 'time', 'availability', 'route precise', and 'route frequency' were the public transport components that ridership valued most. Dell'Olio *et al.* (2011) investigated the quality of service desired by public transport users of the city of Santander. 'Waiting

time', 'cleanliness' and 'comfort' were highlighted as being related to the intention to use the public transport. Le-Klahn (2012) revealed that passengers in Germany felt satisfied with 'punctuality', 'reliability', 'network connection', and 'service frequency' in public transport while they were dissatisfied with 'staff service', 'comfort at bus stops', and 'the ticket price'. Also, Barabino *et al.* (2012) reported that 'security', 'bus reliability', 'cleanliness', 'frequency' were crucial factors of passenger satisfaction towards service quality in Italy. Govender (2014) revealed that upgrading the perceived service components played an important role in determining the customer satisfaction in bus transport services and they could also increase the demand for public buses, reducing the use of private car. In addition, many reviews of the literature confirmed the importance of improving the service quality of the public passenger transport (Cullinane, 1992; Friman *et al*., 2001; Eboli and Mazzulla, 2007; Kottenhoff, 2007; Stradling *et al*., 2007; Friman, 2010; Dziekan *et al*., 2011), which had provided service providers and policy makers with adequate evidences that could be utilized in the decision making process.

Although there are many models that have been developed to investigate the passenger perspectives on the bus transport service quality such as SERVQUAL model developed by Parasuraman *et al.* (1988) and adopted by Sahney *et al.* (2004), Githui *et al.* (2010) and Randheer *et al.* (2011), the model developed by MORI (2004, 2010) seemed more simple and pragmatic (Chandrakumara, 2014). In this model, five main drivers of satisfaction in the public services included 'Delivery', 'Timeliness', 'Information', 'Professionalism' and 'Staff Attitude' (Figure 2). Five main drivers included 'Delivery' - the service delivers the outcome it promised and manages to deal with any problems that might arise; 'Timeliness' - the service responds immediately to the initial customer contact and dealt with the issue at the heart of it quickly and without passing it on between staff; 'Information' - the information given out to customers was accurate and comprehensive and they were kept informed about progress; 'Professionalism' - staff were competent and treat customers fairly; 'Staff attitude' - staff were friendly, polite and sympathetic to customers' needs. Furthermore, MORI (2004, 2010) also recommended how to determine the elements, which should be investigated regarding particular services. In light of the above, this research applied the dimensions of MORI (2004, 2010) to measure bus service quality in the public bus sector based on customer caring approach.

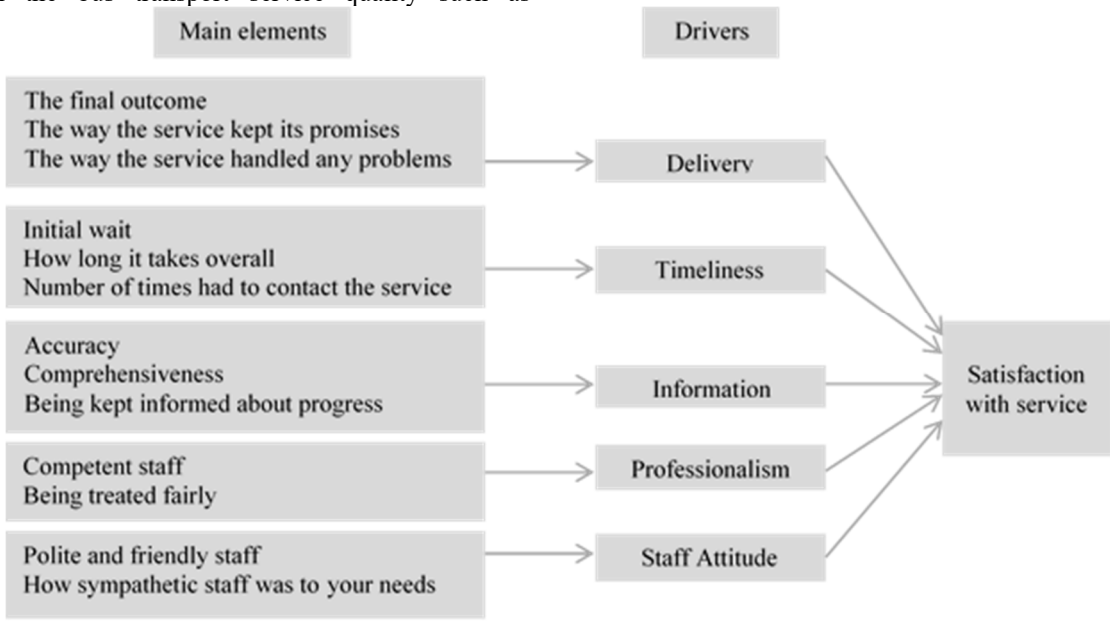

Fig. 2:The MORI model of customer satisfaction (MORI, 2004, 2010)

3 MATERIALS AND METHODS

3.1 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; Aidoo *et al.*, 2013). The BLR model allows us to establish a relationship between a binary outcome variable (dependent variable) and a group of predictor variables (independent variable). In this research, the BLR model with a dependent

variable Y (Y has 2 values: Y= 0 or Y= 1) was employed to represent ridership assessment of the overall bus transportation service quality, condition on the level of satisfaction of the individual service elements provided by bus transport providers. The BLR model was defined as (Agresti, 2007):

$$Ln\ (Odds) = \text{Ln}\frac{P(Y=1)}{1-P(Y=1)} = \alpha + X\beta$$

Where: $P(Y=1)$: the probability of a passenger who evaluated the overall service as being good due to the satisfaction level of the individual service elements; $1-P(Y=1)$: the probability of a passenger who evaluated the overall service as poor due to the satisfaction level of the individual service elements; $Odds$: The ratio of the probability of a ridership who evaluated the overall service as being good to that of the probability of a passenger who assessed the overall service as poor and $Odds = \frac{P(Y=1)}{1-P(Y=1)}$ $or\ Odds = e^{\alpha+X\beta}$; α and β: the intercept and a vector of slope coefficient respectively; X: a vector of explanatory variables representing the satisfaction level for individual service element. Maximum likelihood estimation method was used to estimate the parameters in the model. The estimated value of β represented the impact of the explanatory variable X on the $Ln\ (Odds)$ of response Y=1 (Agresti, 2007).

3.2 Data collection

A commuter intercept survey and face-to-face interviews were employed for data collection. The questionnaire used in study was based on the reviewed researches in this work. The questionnaire was divided into two parts: the first part contained the socioeconomic characteristics of the passengers including 'gender', 'age', 'education', 'occupation', 'the purpose of trip', 'marriage' and 'income', the second part was the model developed by MORI (2004, 2010) which was adapted for the HCMC context and incorporated other service elements identified from previous studies in the literature review. The elements in MORI model that was adjusted to be suitable for this research presented in Table 1 below.

Table 1: Key drivers and main elements in questionnaire

Key Drivers	Main elements	
Delivery	QL	Quality of bus
	AS	Availability of seats
	EGOGF	Ease of getting on and off the bus
	CVC	Cleanliness of vehicle interior
	SOC	Safety on crime while in the bus
	PC	Price/ cost charged
Timeliness	FOS	Frequency of service
	WTBS	Waiting time at bus station
Information	IOTT	Information on transport routes and timetables
	AOA	Accuracy of announcement and information on services
Professionalism	ORL	Obey road laws
	DNCWU	Driver and Conductor wears uniforms
	RBM	Return the balanced money to customer
	BBDC	Behavior of the bus driver and conductor
Staff attitudes	CC	Customer care

For each service elements, the ridership was asked to evaluate their satisfaction level on these service components and overall service quality of public transport on a two-point scale (satisfied or dissatisfied).

Based on BLR model, in this research the model of the ridership assessment of the overall bus transportation service quality could be written as:

$$\begin{aligned}\text{Ln}\frac{P(Y=1)}{1-P(Y=1)} = {} & \beta_0 + \beta_1 QL + \beta_2 AS \\ & + \beta_3 EGOGF + \beta_4 CVC + \beta_5 SOC \\ & + \beta_6 PC + \beta_7 FOS + \beta_8 WTBS \\ & + \beta_9 IOTT + \beta_{10} AOA + \beta_{11} OBR \\ & + \beta_{12} DNCWU + \beta_{13} RBM \\ & + \beta_{14} BBDC + \beta_{15} CC \\ & + \beta_{16} Gender + \beta_{17} Age \\ & + \beta_{18} Education \\ & + \beta_{19} Occupation + \beta_{20} Trip \\ & + \beta_{21} Marriage + \beta_{22} Income \\ & + \varepsilon\end{aligned}$$

Pre-testing and pilot study were also conducted to make sure that the measuring instrument represented the goal of the study in terms of the information to be gathered (Aaker *et al.*, 2001). To ensure that all types of commuters could be surveyed, 500 commuters randomly selected were interviewed during an entire week at 8 bus stations and 8 bus routes (Table 2) form Monday to Sunday. A total of 495 commuters were used to calibrate the binary logit model. The interviewing process lasted about 30 min. The age of the respondents was limited to between 15 years and 60 years. This was to enable only ridership that could travel without being given any assistance to take part in the interview. Also, people in this age range had regular commuting travel routine.

Table 2: The bus routes selected for survey

Bus route		Bus ticket (VND/ a passenger)	Number of respondents
T-B-T	Trung Son - Ben Thanh - Tan Son Nhat	5000	54
C-H	Cho Lon - HCMC University of Agriculture and Forestry	6000	69
U-B-N	University of Technology - Ben Thanh - National University	6000	105
B-C	Ben Thanh - Cho Lon bus station	5000	45
C-G	Cho Lon bus station - Go Vap	5000	47
M-M	Eastern bus station - 3/2 - Western bus station	5000	67
B-L-N	Ben Thanh - Linh Trung industrial zone - National University	6000	65
P-A-A	23/9 Park - Au Co - An Suong bus station	5000	48

4 RESULTS AND DISCUSSION

4.1 Descriptive statistics

The sample consisted of 35.6% of males and 64.4% of females. The number of female ridership was much higher than those of male ones. It showed that the percentage of passenger traveled by bus for business and study was very close to the percentage of the number of passenger traveled for other purposes (50.3% and 49.7% respectively). Higher proportion (66.1%) of the passengers traveling by bus transport had the salary above 3 million VND. Also, ridership who was not high school students, accounted for 63%. The figure for single passenger (68.5%) was higher than those of married ridership (31.5%). Only 24% passenger from 15 to 22 years old traveled by bus. In terms of occupation, student and white-collar worker accounted for 34.7% in comparison with other career (Table 3).

Table 3: Descriptive statistics of the sample

Demographic Characteristics		
Profile	**Category**	**Frequency (%)**
Gender	Male	176 (35.6)
	Female	319 (64.4)
The purpose of trip	Business and Study	249 (50.3)
	Others	246 (49.7)
Income	Above 3 million VND	327 (66.1)
	Below 3 million VND	168 (33.9)
Education	High school	183 (37.0)
	Others	312 (63.0)
Marriage	Single	339 (68.5)
	Couple	156 (31.5)
Age	From 15 to 22	119 (24.0)
	Above 22	376 (76.0)
Occupation	Student and white-collar worker	172 (34.7)
	Others	323 (65.3)

When respondents were asked about the means of transport, they used the most in recent months, apart from motorcycle which had been used the most (98.0 %), public bus transport was the second mode of transport they had chosen to travel most (53.2 %) (Figure 3).

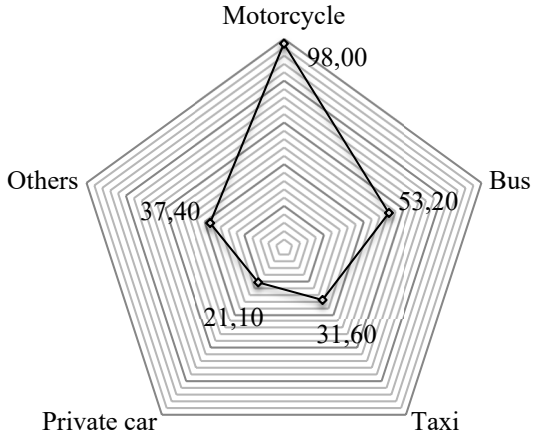

Fig. 3: The means of transport used most in recent months

Although there were many road users travelling by bus, they did not feel fully satisfied with bus services. Figure 4 presented the statistics of passenger satisfaction and dissatisfaction level with regard to the individual bus transportation service element.

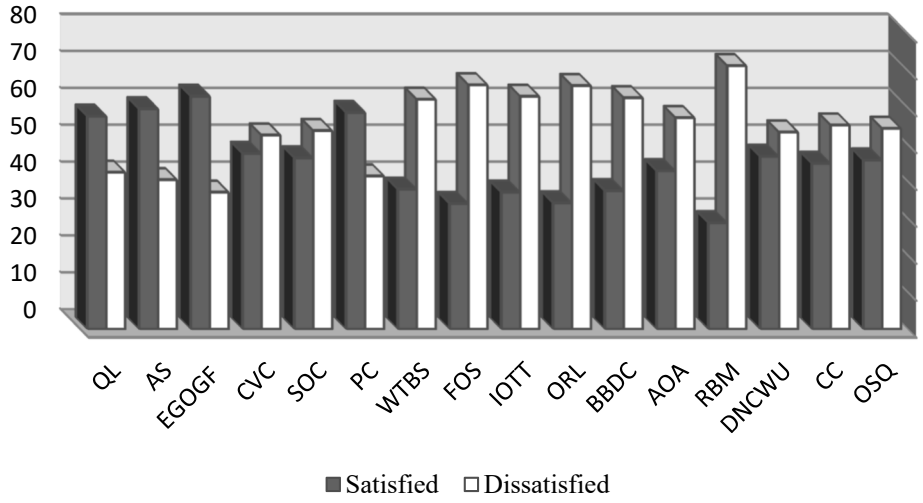

Fig. 4: The statistics of passenger satisfaction and dissatisfaction level

In fact, ridership expressed their dissatisfaction with the majority of service components such as waiting time at bus station (62.2%), frequency of service (66.1%), information on transport routes and timetables (63.0%), obey road laws (65.9%), return the balanced money to customer (71.3%), customer care (55.2%). Few services components (quality of bus (57.6%), availability of seats (59.6%), ease of getting on and off the bus (63.0%), price/cost charged (58.6%) satisfied customers. In general, passengers were dissatisfied with bus transportation services in HCMC.

4.2 Findings from Binary Logistic Regression Model

To assess the impact of the level of satisfaction of individual service elements on ratings for overall service quality, the BLR model was fitted to the data. The maximum likelihood estimates of the fitted binary logit model were condensed in Table 4. Model 1 was estimated with only 15 variables of bus service elements while model 2 was estimated with 15 variables of service components and 7 demographic variables. The coefficients for all the variables were estimated relative to the selected reference category (Table 4)

Table 4: Estimations from the Binary Logistic Regression model

	Model 1				Model 2				
Variable	**B**	**S.E.**	**Sig.**	**OR**	**B**	**S.E.**	**Sig.**	**OR**	**M.I***
Constant	-6.903	0.740	0.000	0.001	-6.628	0.846	0.000	0.001	
QL	0.212	0.346	0.540	1.236	0.396	0.367	0.281	1.486	
AS	0.959	0.462	0.038	2.609	0.974	0.495	0.049	2.649	0.24
EGOGF	1.087	0.407	0.008	2.964	1.236	0.432	0.004	3.443	0.31
CVC	1.506	0.364	0.000	4.510	1.591	0.386	0.000	4.907	0.40
SOC	0.853	0.351	0.015	2.347	0.778	0.366	0.034	2.176	0.19
PC	0.940	0.374	0.012	2.561	1.033	0.397	0.009	2.808	0.26
WTBS	1.408	0.398	0.000	4.089	1.362	0.416	0.001	3.905	0.34
FOS	0.883	0.401	0.028	2.419	0.915	0.438	0.037	2.496	0.23
IOTT	2.089	0.403	0.000	8.074	2.179	0.427	0.000	8.835	0.54
ORL	2.404	0.413	0.000	11.065	2.564	0.445	0.000	12.986	0.64
BBDC	1.568	0.368	0.000	4.795	1.681	0.390	0.000	5.373	0.42
AOA	0.645	0.351	0.066	1.905	0.812	0.380	0.033	2.253	0.20
RBM	0.314	0.392	0.423	1.369	0.365	0.842	0.664	1.441	
DNCWU	0.020	0.417	0.961	1.021	-0.268	0.451	0.553	0.765	
CC	0.819	0.350	0.019	2.269	0.895	0.376	0.017	2.448	0.22
Gender	No				-2.091	0.731	0.004	0.124	
Age	No				-0.341	0.399	0.393	0.711	
Income	No				2.849	0.924	0.002	17.266	
Trip purpose	No				-0.494	0.377	0.190	0.610	
Education	No				-0.468	0.373	0.209	0.626	
Marriage	No				-0.015	0.823	0.986	0.985	
Occupation	No				-0.717	0.694	0.302	0.488	
-2 Log likelihood	236.320				220.480				
Model Chi-square	446.156, df = 15, p < 0.001				461.996, df = 22, p = <0.001				
Cox & Snell R^2	0.594				0.607				
Nagelkerke R^2	0.794				0.811				
N	495				495				

*Marginal impact

Model 2:

$$Ln = \frac{P}{1-P} = -6.628 + 0.974\,\text{AS} + 1.236\,\text{EGOGF} + 1.591\,\text{CVC} + 0.778\,\text{SOC} + 1.033\,\text{PC} + 1.362\,\text{WTBS} + 0.915\,\text{FOS} + 2.179\,\text{IOTT} + 2.564\,\text{OBR} + 1.681\,\text{BBDC} + 0.812\,\text{AOA} + 0.895\,\text{CC} - 2.091\,\text{Gender} + 2.849\,\text{Income}$$

In the Model 2, demographic variables such as gender and income contributed to explain the model. Chi-square omnibus tests of coefficients of Model 2 showing the value of 461.996 on 22 df, significant beyond 0.000 confirmed that a test of the full model against a constant only model was statistically significant. In this model, the independent variable had a significant effect. The -2 log likelihood reflected the prediction deviation by the model. A smaller value indicated a better fit. With regard to Model 2, the -2 Log Likelihood statistics had dropped to 220.480, indicating that the expanded model was much better than the model without demographic characteristic. The R^2 statistics had also increased. The Model 2 had Cox and Snell's R^2 = 0.607 and a Nagelkerke R^2 = 0.811, which explained 81% of the variation in the dependent variable. From the BLR model, the coefficients of service elements had positive values that meant that when ridership felt satisfied with the service elements, their rating for overall service quality would increase.

In terms of 'Delivery', the findings showed that ridership who were satisfied with 'availability of seats' tended to be 24% to rate the overall service quality to be good in comparison with those who were dissatisfied with 'availability of seats'. This indicated that ridership's satisfaction of overall service quality marginally depended upon the availability of seats in the bus (OR=2.649; p=0.049). Concerning 'ease of getting on and off the bus', ridership pleased with this service element tended to be approximately 31% to rate the overall service quality to be good in comparison with those who felt dissatisfied with 'ease of getting on and off the bus'. The result was marginally significant (OR=3.443; p=0.004) and also in agreement with the research findings of Transpor-

tation Research Board in the USA (1995). Passengers who were pleased with the service element relating to 'cleanliness of vehicle interior' tended to be about 40% to rate the overall service quality to be good (OR=4.907; p=0.000). This finding agreed with Barabino *et al.* (2012) and Kostakis and Pandelis (2009) that 'cleanliness of vehicle interior' was one of the important service components determining the service quality and customer satisfaction in transport. It was found that passengers who were satisfied with 'safety on crime while in the bus' tended to be 19% to rate the overall service quality to be good compared to those who were dissatisfied with 'safety on crime while in the bus' (OR=2.176; p=0.034). This finding was in agreement with the result of Chen and Lai (2011) that ridership did not gain their satisfaction with transport services unless the quality of services which related to their safety was guaranteed. With regard to 'price/cost charged', passengers who were pleased with this service component tended to be about 26% to rate the overall service quality to be good. The result was marginally significant (OR=2.808; p=0.009). In fact, travelers will be pleased with the overall service if they believe that the price charged is equivalent to the services they are offered. The result supported the research of Shiftan and Sharaby (2012) that low fare would draw more passengers' attention, keeping them using service and then increasing revenue and profit of service providers.

With respect to 'Timeliness', passengers satisfied with 'waiting time at bus station' tended to be 34% to rate the overall service quality to be good compared to those who were dissatisfied with 'waiting time at bus station' (OR=3.905; p=0.001). The results also supported the findings of Dell'Olio *et al.* (2011). Travelers who were pleased with 'frequency of service' tended to be 23% to rate the overall service quality to be good compared to passengers who were dissatisfied with 'frequency of service' (OR=2.496; p=0.037). In the research conducted by Kostakis and Pandelis (2009), Barabino *et al.* (2012), these authors also confirmed that 'frequency of service' played an important role in determining passenger satisfaction. With regard to 'Information', passengers satisfied with 'information on transport routes and timetables' tended to be 54% to rate the overall service quality to be good (OR=8.835; p=0.000). Concerning 'accuracy of announcement and information on services', travelers satisfied with this service component tended to be 20% to rate the overall service quality to be good. The result was marginally significant (OR=2.253; p=0.033). Furthermore, this result was also in agreement with the findings of Chandrakumara (2014), Transportation Research Board (1995) that 'information on transport routes and timetables' should be improved to increase passenger satisfaction. In terms of 'Professionalism', ridership pleased with 'obey road laws' tended to be 64% to rate the overall service quality to be good in comparison with those who felt dissatisfied with 'obey road laws' (OR=12.986; p=0.000). Passengers satisfied with 'behavior of the bus driver and conductor' tended to be 42% to rate the overall service quality to be good (OR=5.373; p=0.000). Apart from many components measured bus service quality, customer care of the public passenger bus service was one of the main topics of criticism and receives concerns from many researchers (Chandrakumara, 2014). The findings of this research showed that ridership who were satisfied with 'Staff attitudes', particularly 'customer care' were about 22% to rate the overall service quality to be good compared to those who were dissatisfied with 'customer care' (OR=2.448; p=0.017)

With respect to demographic variables, the coefficient β for gender was negative. The reference was female (variable coding female = 0), so female was more likely to please with bus transport service than male. In fact, customer satisfaction would be the motivation to drive female ridership to use more service than male passengers. In addition, in this research, the number of female passenger was higher than those of male ridership (Table 3). The result supported the findings of research conducted by Barabino and Deiana (2012) that female had higher travelling frequency than male, and it seemed to be "the need to concentrate more on high-frequent female customers rather than low-frequent male ones". This finding also contributed to the previous research about transportation and gender (Church *et al.*, 2000; Matthies *et al.,* 2002; Less *et al.*, 2005). Besides, the income coefficient was positive (β = 2.849, p=0.002) which meant that an increase in bus user's income would increase passenger rating for overall service quality. Indeed, the majority of bus users in HCMC has low income; therefore, the change in bus ticket would lead to the change in passenger satisfaction which in turn influenced ridership's travel behavior. When being asked about passenger's willing to pay for new bus ticket whose price increased 40% and 60% respectively, the result showed that the number of passenger who accepted new bus ticket decreased in every bus route compared with the figure of bus user before increasing 40% and 60% bus fare (Figure 5).

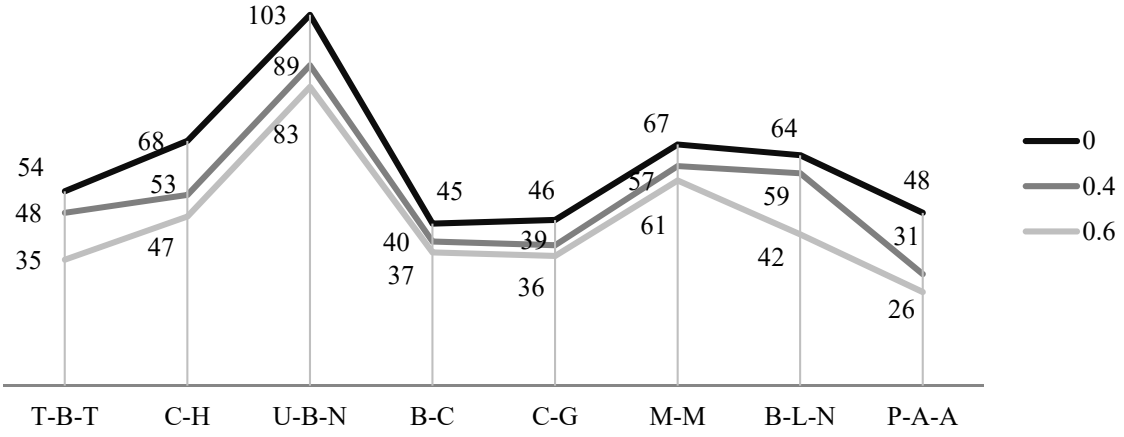

Fig. 5: Number of ridership on each bus route willing to pay for new bus ticket

Besides the measurement criteria of passenger satisfaction for bus transport services as described above, an open question was also designed in the survey to gather passengers' opinions about what factors influenced their choice of bus transportation and increasing their overall satisfaction. Besides giving their opinions, the respondents were also asked to rate the important level (from 1 to 5 with 1 – Not important and 5 – Very important) for each of their suggestion simultaneously. Data after being collected were analyzed by the relative important index (RII). The (RII) could be calculated by the following equation:

$$RII = \frac{\sum W}{A * N}$$

Where:

W - the weight given to each factor by the respondents and range from 1-5

A - the highest weight =5

N - the total number of respondents

The findings of analysis were presented in Table 5.

Table 5: The relative important index (RII) for factors influencing ridership's choice of bus transportation and their satisfaction

Factors	Number of respondents agreed	RII	Ranks
Complaints	322	0.888	1
Safety at bus stop	316	0.837	2
Local environmental impact	310	0.752	3
Incentives for students and the disadvantaged group	269	0.717	4
Special bus lane and prioritized traffic signal	251	0.659	5
Short distance between bus station	122	0.605	6

As a result, most of ridership recommended that if bus transportation service operators longed for attracting more passengers and keeping the customer satisfied, they had to take into account some elements such as 'complaint resolve' (0.888, N=322 recommendations), 'safety at bus stops' (0.837, N=316 recommendations), 'local environment impact' (0.752, 310 recommendations), 'incentives for student and the disadvantaged group' (0.717, N=269 recommendations), 'special bus lane and prioritized traffic signal' (0.659, N=251 recommendations), and 'short distance between bus station' (0.605, N=122 recommendations) (Figure 6).

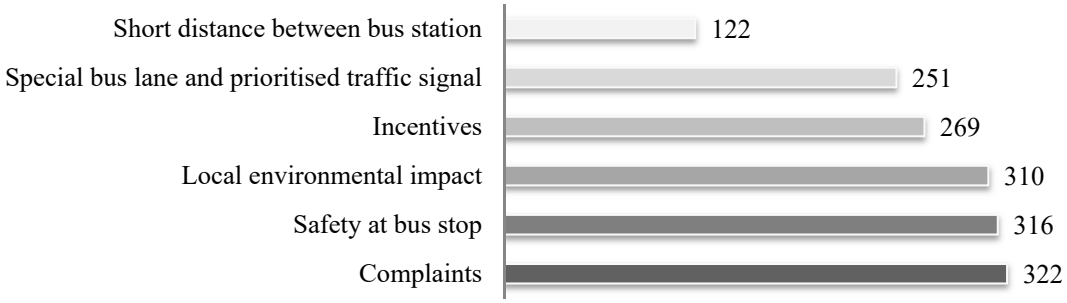

Fig. 6: The service components ridership recommended

In the context of bus service in HCMC, those issues ridership recommended have been given low weight or even ignored by local authorities and bus service providers. For example, because of the degradation of bus vehicles, they have been one of the main causes that trigger air pollution in HCMC. The average emissions of bus vehicle in rush hour/traffic jam is too high compared with other vehicles that makes road users have annoyed and also have prevented them from using bus transportation service (Table 6).

Table 6: The average emissions of vehicle in rush hour/traffic jam (ton/year) (Bang, 2014)

Vehicle groups	NO_x	CO	SO_2	NMVOC	CH_4
Motorcycle	10.999	1.667.430	4.789	200.549	18.242
Bus	6.054	39.549	389	5.611	382
Car	4.884	48.671	452	10.891	843

Furthermore, passenger's recommendations implied that urban bus service had to be incorporated with other public services such as road infrastructure, urban planning and even social welfare. Therefore, improving bus transportation should be conducted simultaneously with the development of other public services in order to increase ridership satisfaction and achieve sustainable transportation development.

5 CONCLUSIONS AND RECOMMENDATIONS

5.1 Conclusions

Bus transportation can be used to 'kill two birds with one stone' (Randheer *et al*., 2011). Firstly, better bus transportation service quality can attract a large number of citizens in HCMC to reduce the use of private vehicles like car, motorcycles and others. Secondly, better bus service quality will solve the traffic problem in HCMC. To determine the passenger satisfaction with bus service quality and to improve the quality of the public passenger transport service based on the point of view of the passenger, the Binary Logistic Regression (BLR) model examines the passenger satisfaction with individual bus service elements which in turn impact on both passenger satisfactions with bus service quality and their overall rating of bus service. The findings suggests that among the independent variables considered, variables including 'availability of seats', 'ease of getting on and off the bus', 'cleanliness of vehicle interior', 'safety on crime while in the bus', 'price/cost charged', 'waiting time at bus station', 'frequency of service', 'information on transport routes and timetables', 'obey road laws', 'behavior of the bus driver and conductor', 'accuracy of announcement and information on services', 'customer care' are significant elements that impact on passenger rating for overall service quality. Also, 'gender' and 'income' are found to influence passenger rating for overall service quality. 'Quality of bus', 'return the balanced money to customer', 'driver and conductor wears uniforms', 'age', 'trip purpose', 'education', 'marriage', 'occupation' are not significant factors.

Moreover, recommendations from passengers including 'complaint resolve', 'safety at bus stops', 'local environment impact', 'incentives for student and the disadvantaged group', 'special bus lane and prioritized traffic signal' and 'short distance between bus station' are very useful in aiding the local authorities, service providers in making decisions or upgrading service quality to achieve customer's satisfaction and sustainable transportation development.

5.2 Recommendations

To improve the bus service quality and to achieve the customer satisfaction, some suggestions are mentioned as follows:

With respect to *service components,* all bus doors including emergency door and entering/getting-off

door must be operated well. Seats, handrail should be in the good condition and could be used safely by passengers. The guidance of the priority in the seat to the elderly, the disable and the other disadvantaged groups should be displayed at the front and middle of the bus so that everyone could notice and read. Also, the guidance of the bus routes, the name of the bus stop, bus schedule, and the audio of bus stop information should function well and the audio has to be synchronous with information displayed in the screen on the bus. The bus should be cleaned twice a week and be offered the maintenance regularly. Security camera system and alarm system should be provided inside the bus, and they have to be monitored and responded to immediately. If there are any technical problems occurred, they have to be repaired as soon as possible. Drivers and other staff onboard should make aware of their responsibilities. Drivers have to have driving license and they should be trained how to use equipment on the bus as well as how to manage any injury to a passenger. The first-aid-kit for injuries must be available. At the bus stop, appropriate facilities including seat, trash bin, and information of bus route or timetables should be available for waiting passenger. Regular cleaning and maintenance should be ensured to keep the bus safe, cleanliness and comfort. Customer service telephone number should be provided inside the bus and at the bus stop. Procedures for handling and recording customer complaints should be established. Passenger's complaints should be resolved within seven days after it has been forwarded, and then complaints should be responded to in a timely manner and courteous ways. Older version of bus and more polluting buses can lead to considerable health risks for ridership and even the whole society. In order to protect ridership and community against bus exhaust and to offer significant safety improvements, regular reviewing age and condition of bus fleet, and replacing old buses are things that have to be taken into account by bus operators. Besides, owing to the fact that 'income' is also the factor that impacts on customer's travelling and satisfaction, some incentives in terms of bus fare such as special discounted or free-of-charge bus ticket for both seniors (60 or older), children (under 6 years old), student and other disadvantaged groups should be considered to attract more road users to travel by bus.

In terms of *demographic characteristics*, besides some suggestions related to service components mentioned above, to satisfy female customers and also attract more female ridership, security and safety are two key factors that need to be taken into account by bus operators as women in this study cited safety concerns as one of their negative perceptions about bus service. Security and safety on board, security and safety at bus station, security and safety when getting in/off bus or even the safety of the walk to and from bus station should be ensured by taking advantages of customer service telephone number, security camera system, light system, security guards on board or at bus station, etc. In addition, 'income' plays an important role in determining ridership satisfaction, therefore before pricing for bus ticket, some surveys of passenger income or household survey should be conducted by bus operators and local authority so that they have a foundation for appropriate bus ticket pricing.

6 LIMITS OF THE STUDY

As with all empirical studies, this research had limitations. Firstly, the data were gathered in a specific geographic area of HCMC with a limited number of bus routes. As a result, the study's findings could be specific only for selected bus routes in HCMC. Hence, the results of this study could not be generalized and could not be representative of the whole population. Secondly, there were several latent factors not considered in the analysis, e.g. weather conditions, time periods and ticket payment systems, bus drivers' psychological factors.

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