Factors Affecting Students' Satisfaction Towards Bus Services in Campus

Masnita Misiran[1,3,1], Hasimah Sapiri[1,2], Zahayu Md Yusof[1,4,3], and Massudi Mahmuddin[2,4]

[1]School of Quantitative Sciences, Universiti Utara Malaysia, Sintok Kedah, Malaysia
[2]School of Computing, Universiti Utara Malaysia, Sintok Kedah, Malaysia
[3]Center for Testing, Measurement and Appraisal, Universiti Utara Malaysia, Sintok Kedah, Malaysia
[4]Institute of Strategic Industrial Decision Modelling, Universiti Utara Malaysia, Sintok Kedah, Malaysia

[1]masnita@uum.edu.my; [2]hasimah@uum.edu.my; [3]zahayu@uum.edu.my; [4]ady@uum.edu.my

ABSTRACT

The reliability of public transport services (e.g., bus) is a critical factor to be considered among public transport users. This factor is important for the consequences that come with unreliability will significantly increase unnecessary anxiety and discomfort. Such consequences include additional waiting time, late arrival at destinations, and missed connections. The ability of the system to follow the planned schedule and maintain consistent travel time are some of the factors that need to be in focus. In this study, we investigated satisfaction among students who reside in campus towards bus services provided by the university. Factor analysis and structural models were developed to achieve the research objective. Three factors have significant relationships with students' satisfaction. The finding also indicated that bus services are an important requirement of the on-campus students.

Keywords: *Public transport; bus services, university campus; students' satisfaction*

INTRODUCTION

Among the targets in Sustainable Development Goals (SDG), Goal 4 on Quality Education, is to build and upgrade educational facilities to ensure safe, nonviolent, inclusive, and effective learning environments for all. In a campus packed with 15,000 denizens at one particular time, transportation facilities are necessary to ensure the achievement of the target. As Universiti Utara Malaysia is a university that is committed to sustainability agenda and most of its residents stay inside the campus, this university provides bus services that enable effective mobility inside and outside the campus.

The efficiency of bus transportation has been available in the study for a long time. A bus service that can carry passengers to the destination is called a supply bus, while Keeler et al. (1975) identified the most effective approach of transportation for urban locations in terms of cost of trips per passenger is bus transit. In recent years, many studies on bus service as main transportation are focusing on issues in the urban area (Asplund & Pyddoke, 2018; Zhao et al., 2018; Deng & Zhu, 2020; Wei, Zheng & Wang, 2021), bus electrification (Blynn & Attanucci, 2019; Czogalla & Xie, 2019; Ma, Liu & Qu, 2021), and sustainability (Corazza & Favaretto, 2019; Lakatos & Mándoki, 2020; Sittipong & Varabuntoonvit, 2021). It is worth noting that across the span of years, study on satisfaction towards bus services is still relevant even until today (Grisé & El-Geneidy, 2017; Munim & Noor, 2020; Li et al., 2021), satisfaction among students included (dos Reis Silveira et al., 2020; Eresia-Eke, Ngcongo, & Ntsoane, 2020; Javid et al., 2021).

Public transportation should become a key solution for future sustainable transportation. They should have a high level of service quality to satisfy and fulfill a wider range of customer's needs to attract more passengers (Anable, 2005; Friman, Lättman & Olsson, 2020; Gündoğdu et al., 2021). In Universiti Utara Malaysia (UUM), bus services on campus have improved tremendously in the past years. More new buses are brought into residential colleges, and there are also free shuttle buses scheduled to the nearby town, Changloon from Sunday to Thursday. Currently, these buses are frequently available compared to previous years. Starting October 2013, there is a new type of bus on campus, which looks like Rapid KL and Rapid Penang, with improved standing capacity and able to ferry more students.

In this study, the sentiment and satisfaction among students who reside on the campus to bus services provided by the university were investigated. At students' convenience, the university has provided daily routine bus services around the university compound. Bus service is one of the most essential modes of transport needed by students on campus because the majority of the students do not own other modes of transportation in the university. In particular, this study explored the factors affecting students' satisfaction with bus services on campus.

LITERATURE REVIEW

Among the important item that contributes to satisfaction towards bus services is the reliability of the transportation system. It means the system's ability to follow a planned schedule or maintain a consistent travel timetable. Punctuality and progress consistency are the yardsticks for reliability in the transportation system (Chen, 2009; Musso & Corazza, 2015). This factor is important since the consequences that come with unreliability will significantly increase unnecessary anxiety and discomfort. Such consequences include more waiting time, late arrival to destinations, and also missed connections (Bates et al., 2001). Turnquist and Bowman (1980) also highlighted the importance to determine the mode of choice in transportation services. A system that is unreliable has the potential to drive away existing and potential passengers. Florida Planning and Development Lab (2004) states that there is two major dominant consideration affecting customer satisfaction. First, the facility-siting considerations. This means that the setting of bus stop infrastructure should convey stress safe and convenient accessibility for the client while balancing with the need for efficiency of bus operation and reliable service schedule. Second, the facility design emphasizes the client's waiting time. These two considerations strongly influence the success of designing a transportation system that is convenient, comfortable, and secure.

In 2008, a study on the perceived service satisfaction towards public transport has been conducted towards customers in 8 cities in Europe is conducted by Fellesson and Friman (2008). In this study, they highlighted four general factors – the system, the design, staff, and safety. Meanwhile, Eboli and Mazulla (2011) found 16 service quality attributes that positively affect customer satisfaction towards bus services in Cosenza, Italy. These

attributes include the availability of bus stops, route, service frequency, service reliability, furniture of a bus stop, bus capacity (overcrowding), cleanliness, cost, information, promotion, safety, security, personnel, complaints, environmental protection, and maintenance of the bus stop. Another similar survey is previously conducted among public transport users in Norway by Andreassen (1995). He concludes that the most important factors to consider are travel time, fare level, and design of public transport. In yet another study, Friman et al. (1998) studied 13 regions in Sweden and found that respondents were less satisfied when higher frequencies of critical incidents occurred, even after quality improvements to bus services had been implemented. Thus, quality improvements are not the sole contributor to customer satisfaction.

METHODOLOGY

According to the literature, three main factors affecting students' satisfactory level towards bus services are reliability of the bus services, facilities of the buses and bus stations, and attitude of the bus drivers. From the hypotheses we made earlier, we are able to come out with a conceptual model. This conceptual model is represented in Figure 1.
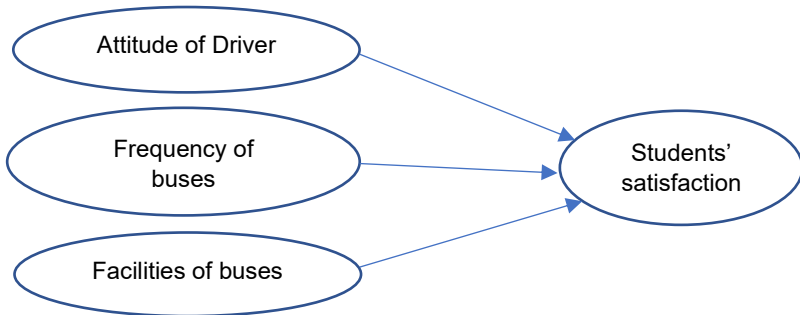
Figure 1: Conceptual Model

There are about 13,000 students on campus. According to Sekaran (2010), the suitable sample size for this population is around 378. As for this study, 400 respondents were selected. Because of the large sample size, a multi-stage cluster sampling method was used. The targeted sample was selected from students who reside in residential in 4 routes. On this campus, there are 4 routes that are being used as bus routes. Route A (Tradewinds and

TNB), Route B (Sime Darby and EON), Route C (Muamalat and YAB), and Route D (SME Bank and Kachi). Eight residential halls which cover every route were selected.

Questionnaires were used for data collection. One block from each student residential hall was randomly picked for sampling purposes. For example, one block was randomly picked from a total of 6 blocks in Sime Darby residential hall as our targeted sample. From that block, we started from the first room and then distributed questionnaires to the residents until we finished collecting 50 answered questionnaires. The reason we set a target of 50 respondents from each block was that we wanted to have a total of 400 answered questionnaires so that the extra questionnaires can be kept as a backup for any missing or incomplete-answered questionnaires later in the analysis.

In order to achieve the objectives, we conducted factor analysis, which took into account all the variables and explains or groups them under factors according to their correlation with one another. After that, a structural model was developed to display the relationship.

According to SEM analysis, we can say that three of our hypotheses are significant in the study. These are:

H_1: University students have a low satisfaction level towards the bus service due to the unreliability of the bus services.

H_2: University students have a low satisfaction level towards the bus service due to the bad quality of facilities of the buses and bus stations.

H_3: University students have a low satisfaction level towards the bus service due to the bad attitude of the bus drivers.

RESULTS AND DISCUSSIONS

Exploratory Factor Analysis is a statistical technique used to derive the set of uncorrelated variables (Cohen, 2005). In order to proceed with factor analysis, the tests on sampling adequacy and the correlation matrix must be

done. If these tests are satisfactory, then the factor analysis may be conducted.

The KMO measures sampling adequacy. The KMO value was greater than 0.5 indicating that it was at a satisfactory value to proceed with factor analysis. The KMO measure was 0.933 which fulfilled the satisfactory value. As for Bartlett's test of sphericity, the results (Approx. Chi-square 4139.42 and Sig.= 0.000) which suggested that the correlation matrix was not an identity matrix. Table 1 shows the list of questions.

Table 1: List of Questions

Reliability of Buses	
Q1	Waiting time at the bus stop of the respective residential hall
Q2	Readily stand-by buses at a bus stop during peak hours in order to occupy as many students as possible
Q3	Time taken for buses to reach lecture hall
Q4	Time taken for buses to depart during off-peak hours
Facilities of Buses	
Q5	More shuttle buses travel from DKG1 to DKG6 and vice versa
Q6	Well-functioning air conditioner in buses
Q7	Clean seats in buses
Q8	Clean curtains in buses
Q9	Sufficient grip to hold on for standing passengers in buses
Q10	Increase number of buses for the residential hall which houses more students
Q11	Include further places such as DKG6 into the bus routine
Attitude of Driver	
Q12	Detailed bus schedule posted on every bus stop
Q13	Driving speed of vehicles
Q14	The attitude of drivers towards students during peak hours
Q15	The cautiousness of drivers during rainy days
Q16	The emotion of drivers while driving
Q17	Awareness of drivers while driving
Q18	The ability of the bus drivers to speak in English in order to communicate with international students
Q19	Awareness of drivers about the condition of buses

Figure 2 displays a scree plot of the eigenvalues versus all the factors. The plot is helpful to determine the number of factors to retain. The point of interest is where the curve starts to flatten. From the plot, we can see that the curve starts to flatten between factors 3 and 4. Factor 4 has a low eigenvalue. From these results, only 3 factors have been retained. The first factor explains 47.240% of the variance, the second factor describes

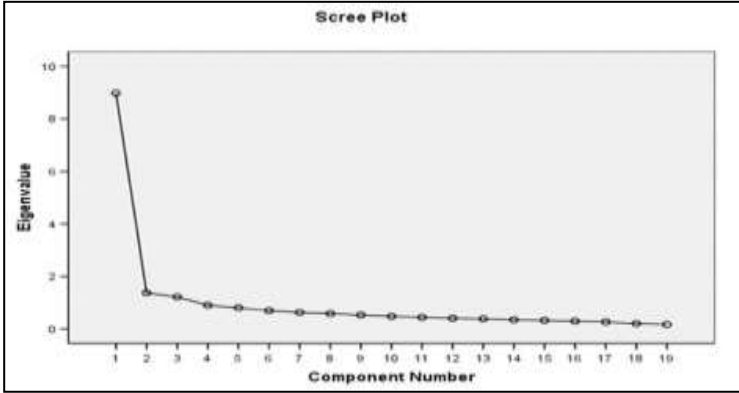7.226%, and the third is 6.408%. All the remaining factors are not significant.

Figure 2: Scree Plot

The rotation method was used to reduce the number of factors with high loading for the variables under investigation. This is to make the interpretation of the analysis easier without actually changing anything. Figure 3 shows that there are 7 items that belong to Factor 1. Another 7 items are for Factor 2 and the rest under Factor 3.

After factor analysis was conducted, there are three factors identified for this study. In addition, the reliability test was conducted to make sure that all these three factors are reliable. A coefficient of 0.821 was reported for the Reliability of Buses. There were 7 items analyzed for facilities of buses. The value of Cronbach's alpha was 0.876 for Facilities of Buses. As for the Attitude of the Driver, the value of Cronbach's alpha was 0.858. All these values suggested that the multi-item measures were reliable.

By using AMOS, confirmatory factor analysis (CFA) was performed to test and confirm the measurement theory. A measurement model was developed to test the fitness of the model. Then, a modified model was constructed to gain a good fit model and made it theoretical to study. There are a series of the goodness of fit indices that reflect the fitness of the model. For model checking, absolute fit, incremental fit, and parsimonious fit were used. The information concerning the fitness index, level of acceptance, and remarks are presented in Table 2.

	Component		
	1	**2**	**3**
Waiting time at bus stop of respective residential hall.			.744
Readily stand-by buses at bus stop during peak hours in order to occupy as many students as possible.			.753
Time taken for buses to reach lecture hall.			.690
Time taken for buses to depart during off-peak hours.			.714
More shuttle buses travel from DKG-1 to DKG-6 and vice versa.	.517		
Well-functioning air conditioner on buses.	.782		
Clean seats in buses.	.837		
Clean curtain in buses.	.786		
Sufficient grip to hold on for standing passengers in buses.	.566		
Increase number of buses for residential hall which houses more students.	.507		
Include further places such as DKG-6 into the bus routine.	.500		
Detailed bus schedule pasted on every bus stop.		.588	
Driving speed of vehicles.		.650	
Attitude of drivers toward students during peak hours.		.657	
Cautiousness of drivers during rainy days.		.608	
Emotion of drivers while driving.		.667	
Awareness of drivers while driving.		.638	
Ability of the bus driver to speak in English in order to communicate with international students.		.691	
Awareness of drivers about condition of buses.	.513	.558	

Figure 3: Rotated Component Matrix

Table 2: Index Categories and the Level of Acceptance for Every Index

Category	Index	Level of acceptance	Remarks
Absolute fit	Chisq	P > 0.05	Sensitive to sample size > 200
	RMSEA	RMSEA < 0.08	Range 0.05 to 1.00 acceptable
	GFI	GFI > 0.90	GFI = 0.95 (good fit)
Incremental fit	AGFI	AGFI > 0.90	AGFI = 0.95 (good fit)
	CFI	CFI > 0.90	CFI = 0.95 (good fit)
	TLI	TLI > 0.90	TLI = 0.95 (good fit)
	NFI	NFI > 0.90	NFI = 0.95 (good fit)
Parsimonious fit	Chisq/df	Chi square/ df < 5.0	Below 5.0

All factor loadings exceeded the required value of 0.6, and the fitness indices for measurement model Reliability of Buses (ROB) at the requirement level were fulfilled. The fitness indices for measurement model ROB are presented in Table 3. Other measures are shown in Table 4 and Table 5.

Table 3: Goodness of Fit for Reliability of Buses

Items	Index Name	Value	Remarks
Q1, Q2, Q3, Q4	RMSEA	0.000	Very Fit
	GFI	1.000	Very Fit
	p-value	0.865	Very Fit
	CFI	1.000	Fit

Table 4: Goodness of Fit for Facilities of Buses

Items	Index Name	Value	Remarks
Q5, Q6, Q7, Q8, Q9, Q10, Q11	RMSEA	0.093	Acceptable
	GFI	0.977	Fit
	p-value	0.001	Not Fit
	CFI	0.982	Fit

Table 5 Goodness of Fit for Attitude of Driver

Items	Index Name	Value	Remarks
Q12, Q13, Q14, Q15, Q16, Q17, Q18, Q19	RMSEA	0.103	Not Fit
	GFI	0.949	Fit
	p-value	0.000	Not Fit
	CFI	0.957	Fit

The results in Table 6 suggest that two of the factors have a direct negative satisfaction towards bus services on campus. The factors are the attitude of bus drivers and the reliability of buses. Only the facilities of buses have a direct positive satisfaction towards bus service level in the campus.

Table 6: The importance of each factor affecting the other

Relationship of Factors	Standardized Regression Weight
Student's satisfaction vs Attitude of the bus driver	−0.503
Student's satisfaction vs Reliability of buses	−0.288
Student's satisfaction vs Facilities of buses	0.815

The facility of buses has the highest regression weight which is 0.815. Thus, it is known that the factor facilities of buses have the highest influence on student's satisfaction towards bus service quality in the campus.

CONCLUSIONS AND RECOMMENDATION

In a nutshell, this empirical investigation discovered that there are three factors that have significant relationships towards students' satisfaction with the bus service in UUM. The main requirements of the students were mainly on the facilities of buses. The findings suggested that the university may focus on the facilities that they can provide to the students. This study has explored the factor which dominates the level of students' satisfaction towards bus services. The dominant factor is the facilities of the buses. Nevertheless, there are still areas for further improvement, and one of them is measurement. The goodness of measures can be validated and improved. The item(s) with cross-loading(s) (e.g., item Q19) and relationships among the variables can be further validated.

ACKNOWLEDGEMENT

REFERENCES

Anable, J. (2005). 'Complacent car addicts' or 'Aspiring environmentalists'? Identifying travel behavior segments using attitude theory. *Transport Policy*, *12*(1), 65-78.

Andreassen, T. W. (1995). (Dis)satisfaction with public services: The case of public transportation. *Journal of Services Marketing*, *9*(5), 30-41.

Asplund, D., & Pyddoke, R. (2018). Socially optimal fares and frequencies for urban bus services in small cities. CTS Working paper 2018:1.

Bates, J. J., Polak, J., Jones, P., & Cook, A. J. (2001). The valuation of reliability for personal travel. *Transportation Research*, *37*(2-3), 191-230.

Blynn, K., & Attanucci, J. (2019). Accelerating bus electrification: A mixed-methods analysis of barriers and drivers to scaling transit fleet electrification. *Transportation Research Record*, *2673*(8), 577-587.

Chen, Yu-Fen. (2009). Job stress and performance: A study of police officers in Central Taiwan. *Social Behavior and Personality*, *37*(10), 1341-1356.

Cohen, E. H. (2005). Student evaluations of course and teacher: Factor analysis and SSA approaches. *Assessment & Evaluation in Higher Education, 30*(2), 123-136.

Corazza, M. V., & Favaretto, N. (2019). A methodology to evaluate accessibility to bus stops as a contribution to improve sustainability in urban mobility. *Sustainability, 11*(3), 803.

Czogalla, O., & Xie, F. (2019, October). Methods and tools for public bus fleet electrification in the area of sustainable city transportation. In *26th World Congress on Intelligent Transport Systems.*

Deng, F., & Zhu, J. (2020, September). An express mode of urban bus systems. In *2020 IEEE 23rd International Conference on Intelligent Transportation Systems (ITSC)* (pp. 1-5).

dos Reis Silveira, T. C., Romano, C. A., & Gadda, T. M. C. (2020). Public transport usage among university students: What to expect based on customer satisfaction survey (CSS) analysis. *Transportes*, *28*(3), 32-45.

Eboli, L., & Mazzulla, G. (2011). A methodology for evaluating transit service quality based on subjective and objective measures from the passenger's point of view. *Transport Policy, 18*(1), 172-181.

Eresia-Eke, C., Ngcongo, N., & Ntsoane, T. (2020). The nexus of service quality, student satisfaction, and student retention in small private colleges in South Africa. *Education Sciences*, *10*(7), 179.

Fellesson, M., & Friman, M. (2008). Perceived satisfaction with public transport service in nine European cities. *Journal of the Transportation Research Forum*, *47*(3), 93-103.

Florida Planning and Development Lab (2004). https://fpdl.coss.fsu.edu/ sites/g/files/imported/storage/original/application/907b653416e0c0f3a cf856531910e01d.pdf

Friman, M., Lättman, K., & Olsson, L. E. (2020). Public transport quality, safety, and perceived accessibility. *Sustainability*, *12*(9), 3563.

Friman, M., Edvardsson, B., & Garling, T. (1998). Perceived service quality attributes in public transport: Inferences from complaints and negative critical incidents. *Journal of Public Transportation*, *2*(1), 67-89.

Grisé, E., & El-Geneidy, A. (2017). Evaluating the relationship between socially (dis) advantaged neighborhoods and customer satisfaction of bus service in London, UK. *Journal of Transport Geography*, *58,* 166-175.

Gündoğdu, F. K., Duleba, S., Moslem, S., & Aydın, S. (2021). Evaluating public transport service quality using picture fuzzy analytic hierarchy process and linear assignment model. *Applied Soft Computing*, *100,* 106920.

Javid, M. A., Shah, S. A. H., Ali, N., & Abdullah, M. (2021). Commuters' satisfaction with the service quality of Airlift and Swvl bus services in Lahore. *Engineering and Applied Science Research*, *48*(3), 249-256.

Keeler, Theodore E., & Kenneth, A. (1975). Small, automobile costs and final intermodal cost comparisons. Part III of the full costs of urban transport. *Monograph 21*. Institute of Urban and Regional Development, University of California, Berkeley.

Lakatos, A., & Mándoki, P. (2020). Sustainability analysis of competition in public transport systems: A comparative case study in Hungary and Finland. *Periodica Polytechnica Civil Engineering*, *64*(2), 545-556.

Li, Q., Chen, Q. Y., Liu, Z., & Liu, H. C. (2021). Public transport customer satisfaction evaluation using an extended thermodynamic method: A case study of Shanghai, China. *Soft Computing*, 1-14.

Ma, X., Liu, X., & Qu, X. (2021). Public transit planning and operation in the era of automation, electrification, and personalization. *IEEE Transactions on Intelligent Transportation Systems, 22*(4), 2345-2348.

Munim, Z. H., & Noor, T. (2020). Young people's perceived service quality and environmental performance of hybrid electric bus service. *Travel Behaviour and Society, 20*, 133-143.

Musso, A., & Corazza, M. V. (2015). Visioning the bus system of the future: Stakeholders' perspective. *Transportation Research Record*, *2533*(1), 109-117.

Sekaran, U., & Bougie, R. (2010). *Research methods for business: A skill-building approach* (5th ed.). Haddington: John Wiley & Sons.

Sittipong, W., & Varabuntoonvit, V. (2021). Life cycle sustainability and eco-efficiency for mass transportation in Bangkok: A case study for bus and rapid transit (Doctoral dissertation, Kasetsart University).

Turnquist, M. A., & Bowman, L. A. (1980). The effects of network structure on the reliability of transit service. *Transportation Research B*, 14B: 79-86.

Wei, S., Zheng, W., & Wang, L. (2021). Understanding the configuration of bus networks in urban China from the perspective of network types and administrative division effect. *Transport Policy*, *104*, 1-17.

Zhao, L., Chien, S. I., Spasovic, L. N., & Liu, X. (2018). Modeling and optimizing urban bus transit considering headway variation for cost and service reliability analysis. *Transportation Planning and Technology*, *41*(7), 706-723.