International Journal of Engineering Research and Technology.
ISSN 0974-3154 Volume 11, Number 3 (2018), pp. 403-415

http://www.irphouse.com

Evaluation On Time Performance For Public Bus Service In West Klang Valley

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Abstract

In this article, on time performance for public buses in West Klang Valley was evaluated. 5 main cities in West Klang Valley namely Puchong, Petaling Jaya, Subang Jaya, Shah Alam and Klang was choosen. A bus stop was chosen for each locations and routes as methodology to evaluate on time performance. The arrival time of the buses was recorded and need to compare with the actual schedule arrival time. The actual arrival time at the particular bus stop was compared to the schedule arrival time. Based on the Quality of Service Method of the Transit Capacity and Quality of Service Manual 3rd Edition, 'on – time' was defined as arrival of 1 minutes early to 5 minutes late. The result will grouping in rating A until E. As a main outcomes Puchong rate as B, Petaling Jaya rate as D, Subang Jaya rate as A, shah Alam rate as C and Klang rate as D. In conclusion on time performance for bus services in West Klang Valley is score as 2.6 which fall into rating C.

Keywords: On-time, bus services, bus quality services, bus rating services

I. INTRODUCTION

The definition of bus service according to Transport Safety Victoria, the legal meaning of bus service is the operation of one or more buses that ferries passengers [3][4] In Malaysia, public bus services are mainly chosen by the public because of its low fare and wider coverage as compared to rail or air travel modes. Most public bus services in Malaysia are fully operated by private bus companies. On the other hand, the government also assist these companies by providing bus terminals and also subsiding the fuel [8][9][12].

II. SCOPE OF WORK

The area that was utilized for this study was located at the West Klang Valley, which were included Klang, Shah Alam, Puchong, Subang Jaya, and Petaling Jaya. Shah Alam is the capital state, Klang was the first city in Selangor, and another major urban centre is Petaling Jaya. Due to the modernisation, fast developing happen in the Klang Valley.[14] The state of Selangor has the biggest in economy, population and also the most developed with great infrastructure for example highways and transport[12][13]. With increasing in development, bus operation service is well known mode of transportation due to its cheaper cost and way better coverage of areas compared to other sorts of public transportation [11]

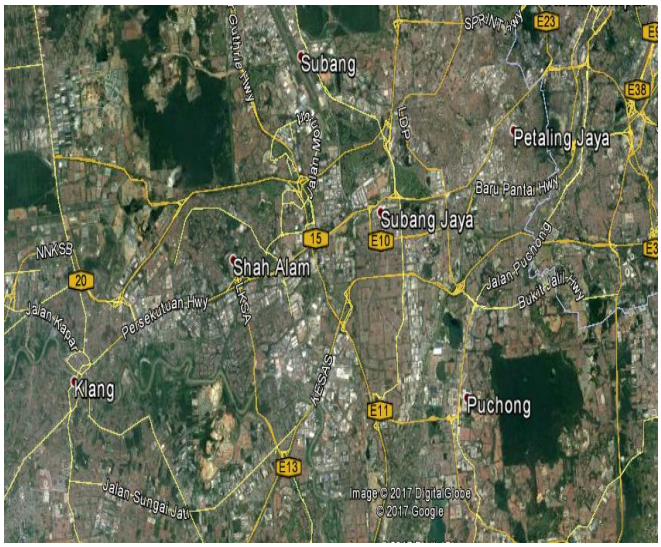

Figure 1. The study area in West Klang Valley

Bus operator which service covered the West Klang Valley most commonly is Rapid Bus. Rapid Bus is one of the biggest bus operator in Malaysia and primarily working in urban areas of Klang Valley, Penang and Kuantan. Rapid Bus also known Rapid KL, however it not the only bus operator in Kuala Lumpur and Klang Valley for example Metrobus, Len Seng, Omnibus, and Nadi Putra too serve in Klang Valley. In any case, in Shah Alam the public buses was operated by Shah Alam City Council (MBSA).

Services that provided at West of Klang Valley is Bus Rapid Transit (BRT). Rapid Bus operates three type of service such as City Shuttles, Trunk Buses, and Local Shuttles also the Express buses. Rapid Bus has divided up the Klang Valley into six areas:

III. METHODOLOGY

On – time performance is refer how successful the services follow published schedule [2]. In data analysis, on time performance is expressed in percentage which mean, the higher percentage, is the higher vehicles follow on time schedule [15].

The level of on time performance for bus in transport systems is a very important to access of the effectiveness of the system. On time performance is a measure of the performance of transport services to be on time[6]. In transportation systems most have timetable. Which describe when vehicles are to arrive at scheduled station or pick point.On time performance is highly important where services are infrequent, and people need to plan to meet services [16].

A bus stop was chosen for each locations and routes. The arrival time of the buses was recorded and need to compare with the actual schedule arrival time. [5]

IV. ANALYSIS

The actual arrival time at the particular bus stop was compared to the schedule arrival time. Based on the Chapter 5 – Quality of Service Method of the Transit Capacity and Quality of Service Manual 3rd Edition [1], 'on – time' was defined as arrival of 1 minutes early to 5 minutes late. To determine the quality of service, need to obtain the on – time performance percentage by using the formula below:

$$\textbf{\textit{The ontime performance percentage}} = \frac{\textbf{\textit{Total on - time arrivals}}}{\textbf{\textit{Total actual arrivals}}} \times \mathbf{100}\%$$

After obtained on – time performance percentage, the value was compared to Table 1 below to determine the quality of service:

Table 1: Quality of service for on time – performance according to TCRP [1]

Quality of Service	**On – time performance percentage**	**Passenger perspective**	**Operator perspective**
A	**95 - 100 %**	Passenger making one round trip per weekday with no transfer experiences one not – on – time vehicle every 2 weeks.	Achievable by transit services operating below capacity on a grade – separated guideway not shared with non – transit vehicles, with few infrastructure of vehicle problems.
B	**90 – 94 %**	Passenger making one round trip per weekday with no transfers experiences one not – on – time vehicle every week.	Not -Achievable by transit services operating on a grade – separated guideway not shared with non – transit vehicles.
C	**80 – 89 %**	Passenger making one round trip per weekday with no transfers	Typical range for commuter rail that shares track with freight rail.

		experiences one – on – time vehicle every week.	Typical range for light rail with some street running. Achievable by bus services in small to mid – sized cities.
D	70-79%	Passenger making one round trip per weekday with no transfers experiences up to three not-on-time vehicles every week Passenger making one round trip per weekday with a transfer experiences a not-on-time vehicle every day	Typical range for light rail with a majority of street running Achievable by bus services in large cities
E	**<70 %**	Service likely to be perceived as highly unreliable.	May be best possible result for mixed traffic operations in congested CBD's.

V. RESULTS

The on - time performance for T600, T604 and T605 in Puchong, PJ02, PJ03 and PJ04 in Petaling Jaya, T776, T777 and T778 in Subang Jaya, T757, T758 and SA01 in Shah Alam, KLG01, KLG02 and 704 in Klang was recorded and tabulated. The on time performance for Puchong, Petaling Jaya, Subang Jaya, Shah Alam and Klang was conducted on weekday and weekend each for a period from 6.00 am to 12.00 am, as accordance to the Transit Capacity and Quality of Service Manual.

LRT IOI Puchong bus stop, LRT Perindustrian Puchong bus stop and LRT Bandar Puteri bus stop has been chosen for route T600, T604 and T605 separately in Puchong. While LRT Taman Jaya bus stop for route PJ02 and LRT Taman Bahagia bus stop for route PJ03 and PJ04 has been chosen for Petaling Jaya. Other than that, in Subang Jaya, LRT USJ 7 bus stop, LRT Taipan bus stop and LRT USJ 21 bus stop has been choose for route T776, T777 and T778 respectively. As for Shah Alam, LRT Alam Megah bus stop, LRT Subang Alam and KTM Shah Alam has been choose for route T757, T758 and SA01 accordingly. Lastly, SRJKC Kong Hee bus stop for route KLG01 and KLG02 and for route 704 bus stop near to the Seranas Bus Terminal has been choose for Klang area.

As the scheduled arrival timetables are not available, the service frequency was used as a guide to evaluate the on time performance of the buses. The summary of the results according to the location are as follows:

The On –Time Performance in Puchong

Table 2 ; The On - Time Performance for Puchong

X1 - no of late arrival

X2 - No of on time arrival

X3 - Total arrive

X4 - Not arrive

X5 - On-time percentage

Route	X1	X2	X3	X4	X5	QOS
T600 (weekdays)	0	20	20	0	100.00	A
T600 (weekend)	1	19	20	0	95.00	A
T604 (weekdays)	3	16	19	0	84.21	C
T604 (weekend)	2	17	19	0	89.47	C
T605 (weekdays)	0	21	21	0	100.00	A
T605 (weekend)	0	21	21	0	100.00	A
					AVERAGE	94.78 (B)

For Puchong, the total arrival scheduled for route T600, T604 and T605 were 20, 19 and 21 for both weekday and weekend respectively. However there were only 20 and 19 on - time arrivals respectively for route T600, while for route T604 the number of on – time were 16 in weekday and 17 in weekend, and lastly for route T605, both weekday and weekend there were 21 on – time arrival. From the data collected, there were few bus running late at route T604 because of traffic congested and buses skipping trip were observe for route T600 and T605 and it cause the busses to be early for the next scheduled arrival time range. The on – time percentage obtained for route T600 on weekday was 100% and 95% on weekend. While for route T605 both weekday and weekend gained 100%. But for route T604 obtained lower compared to T600 and T605 which were 84.21% for weekday and 89.47% for weekend. These values gives an average for Puchong an on- time percentage of 94.78%, which is a QOS of B.

Based on the table 2, it shown the comparison of the on – time performance between weekday and weekend in Puchong. For route T600, the on – time percentage obtained on weekdays is 100% while on weekend it obtained 95%. Other than that, for route T605, both weekday and weekend obtained 100% for on – time performance. So, the QOS of T600 both weekday and weekend were A. Which mean, passengers make a return trip every working day without the experience of not – on – time vehicle every 2 weeks. For perspective operators, accessible by transit services operating below the capacity of non-transit vehicles, which is not shared with non-transit vehicles, with a small vehicle infrastructure problem. As for route T604, weekday the results is 84.21% and on weekend is 89.47% for on – time percentage. Based on the manual, the QOS for

weekday fall under D and on weekend it C. If the QOS obtained is C, the passenger can make a return trip every working day without the experience of not – on – time vehicle every week based on the passenger perspective. For the operator perspective, can be reached by bus services in small to mid-town. Next, if the QOS is D, for passenger perspective, the passenger can make a return trip every working day without the experience up to three not – on – time vehicle every week and for the operator perspective, typical ranges for light rails with most running roads.

The On – Time Performance in Petaling Jaya

Table 3 : The On - Time Performance for Petaling Jaya

X1 - no of late arrival

X2 - No of on time arrival

X3 - Total arrive

X4 - Not arrive

X5 - On-time percentage

Route	**X1**	**X2**	**X3**	**X4**	**X5**	**QOS**
PJ02 (weekdays)	11	20	31	0	64.52	E
PJ02 (weekend)	8	23	31	0	74.19	D
PJ03 (weekdays)	7	24	31	0	77.42	D
PJ03 (weekend)	4	27	31	0	87.09	C
PJ04 (weekdays)	6	25	31	0	80.65	C
PJ04 (weekend)	4	27	31	0	87.09	C
					AVERAGE	78.49 (D)

On other hand, for Petaling Jaya, a total of 31 arrivals were scheduled for route PJ02, PJ03 and PJ04 with 20 and 23 number of on - time arrivals recorded for weekday and weekend respectively for route PJ02. While for route PJ03, the number of on – time arrival on weekday was 24 and on weekend was 27. Other than that, route PJ04 obtained 25 and 27 both weekday and weekend respectively. The problem of buses did arrive late or a trip had been skipped, producing a big headway. The on time percentage for route PJ02 was 64.52% and 74.19% for weekday and weekend respectively, 77.42% on weekday and 87.09% on weekend for route PJ03 and lastly route PJ04 obtained 80.65% and 87.09% for weekday and weekend accordingly. Resulting in an average of 78.49% on - time performance in Petaling Jaya which is QOS D.

For routes PJ02, the on – time percentage on weekday is 64.52% and on weekend is 74.19%. The QOS of weekday is E while for weekend is D. Other than that, route PJ03, for weekday obtained 77.42% and for weekend is 87.09%. QOS for this route on weekday and weekend were D and C respectively. Last route for Petaling Jaya is PJ04.

On weekday obtained 80.65% which the QOS is C and for weekend obtained 87.09. Also the QOS is C. Based on the operator, typical ranges for light rails with multiple runs. As for QOS D, passengers make a return trip every day working with transfer to the vehicle not – on – time every day. Perspective of operator, can be reached by bus service in big cities. Lastly, for QOS E, from passenger perspective, the service likely to be perceived as highly unreliable and for operator perspective is that may be the best result for mixed traffic operations in congested CBD's.

The On - Time Performance for Subang Jaya

Table 4 ; The On - Time Performance for Subang Jaya

X1 - no of late arrival

X2 - No of on time arrival

X3 - Total arrive

X4 - Not arrive

X5 - On-time percentage

Route	**X1**	**X2**	**X3**	**X4**	**X5**	**QOS**
T776 (weekdays)	1	18	19	0	94.74	B
T776 (weekend)	0	19	19	0	100.00	A
T777 (weekdays)	1	17	18	0	94.44	B
T777 (weekend)	0	18	18	0	100.00	A
T778 (weekdays)	0	19	19	0	100.00	A
T778 (weekend)	1	18	19	0	94.74	B
					AVERAGE	97.32 (A)

As for Subang Jaya, the total number of arrival as schedule for route T776 and T778 were 19, and for route T777 was 18 for weekday and weekend. The on – time arrival for route T776 was 18 and 19 both weekday and weekend respectively. At the same time, for route T777 obtained 17 on weekday while 18 on weekend. Route T778 got 19 and 18 for both weekday and weekend accordingly. Based on the observation at the location, a busses skipping trip and some of the driver drive the busses in high speed which result the bus arrive early than the actual schedule. The on – time percentage for route T776 for both weekday and weekend were 94.74% and 100%. Also for route T777 obtained 94.44% for weekday and 100% for weekend. Lastly, route T778 on weekday was 100% and 94.74% on weekend. Average of on – time percentage for Subang Jaya was 97.32%. Based on the QOS it fallen under grade A.

Based on the table 4, it shown the comparison of the on – time percentage for all routes in Subang Jaya. The route T776 on weekday, it obtained 94.74% which the QOS is B while on weekend it obtained 100% which the QOS is A. As for route T777, on

weekday and weekend were obtained 94.44% and 100% respectively. The QOS for weekday is B and on weekend is A. Lastly, route T778, it obtained 100% for weekday and for weekend it got 94.74%. Which mean the QOS for weekday is A, and on weekend is B. Based on the operator if the QOS is A, accessible through transit services operating below the capacity of non-transit vehicles, which are not shared with non-transit vehicles, with little vehicle infrastructure problems. If the QOS is B, cannot be pulled by transit services that operate on a road that is separated grade not shared with non-transit vehicles.

The On – Time Performance in Shah Alam

Table 5 : The On - Time Performance for Shah Alam

X1 - no of late arrival

X2 - No of on time arrival

X3 - Total arrive

X4 - Not arrive

X5 - On-time percentage

Route	X1	X2	X3	X4	X5	QOS
T757 (weekdays)	2	21	23	0	91.30	B
T757 (weekend)	3	21	24	0	87.50	C
T758 (weekdays)	2	21	23	0	91.30	B
T758 (weekend)	1	22	23	0	95.65	A
SA01 (weekdays)	11	21	32	0	65.63	E
SA01 (weekend)	11	19	30	0	63.33	E
					AVERAGE	82.45 (C)

Next, at Shah Alam the total arrival on weekday and weekend were 24, 23 and 32 as schedule for route T757, T758 and SA01 respectively. For route T757 number of on – time arrival were 22 and 21 for both weekday and weekend. Also, route T758 on – time arrival for weekday was 21 and for weekend 22. As for route SA01, 21 and 19 were recorded for on – time arrival both weekday and weekend respectively. There few busses skip the trip and other was cause of traffic congestion resulting the bus not on – time arrive. Based on the number of arrival, it shown that route T757 obtained 91.66% on weekday and for weekend is 87.50%. While for route T758, both weekday and weekend gained 91.30% and 95.65% accordingly. For route SA01, for weekday obtained 65.63% and weekend 63.33%. Overall average for Shah Alam on – time percentage is 82.51% which is QOS C.

Based on the table 5, it shown the comparison of on – time percentage of all routes in Shah Alam. For route T757 the on – time percentage obtained is 91.30% and on weekend is 87.50%. In the manual, the QOS for both weekday and weekend for route T757 were B and C respectively. As for route T758, the on – time percentage on weekday and weekend were 91.30% and 95.65% accordingly. Based on the results is shown that the QOS on weekday is B and on weekend is A. Route SA01 obtained 65.63% for weekday and 63.33% on weekend. Both weekday and weekend obtained QOS E.

The On – Time Performance in Klang

Table 6 : The on - Time Performance for Klang

X1 - no of late arrival

X2 - No of on time arrival

X3 - Total arrive

X4 - Not arrive

X5 - On-time percentage

Route	**X1**	**X2**	**X3**	**X4**	**X5**	**QOS**
KLG1 (weekdays)	10	25	35	0	71.43	D
KLG1 (weekend)	12	20	32	0	62.50	E
KLG2 (weekdays)	16	16	32	0	50.00	E
KLG2 (weekend)	14	21	35	0	60.00	E
704 (weekdays)	2	27	29	1	93.10	B
704 (weekend)	2	27	29	0	93.10	B
					AVERAGE	71.69 (D)

Finally for Klang, total arrival schedule for route KLG01 and KLG02 were 35 and route 704 is 29. Number of on - time arrival for route KLG01 is 25 on weekday and 23 on weekend. Meanwhile route KLG02 were 16 and 21 both weekday and weekend respectively. For route 704, the on – time performance for both weekday and weekend were 27. Resulting the average of on – time performance for Klang is 71.69% which the QOS is D.

Based on the table 6, is the comparison of the on – time percentage QOS for all routes in Klang. It shown that, route KLG01 on weekday obtained 71.43% and on weekend is 62.50%. The QOS for this route is D and E both for weekday and weekend respectively. As for route KLG02, both weekday and weekend obtained 50% and 60% accordingly. Both weekday and weekend the QOS fall under E. Lastly, route 704, the on – time percentage both weekday and weekend were 93.10 which the QOS is B. based on the on – time percentage, it shown that route 704 is better compare to KLG01 and KLG02.

This reason behind of the low QOS at routes KLG01 and KLG02 because the traffics volume in Klang city is high and many lanes were closed for repair. Other than that, route 704 is longer compare to KLG01 and KLG02.

VI. CONCLUSION

Table 7: Summarise QOS of on – time performance in West Klang Valley

Area	On – time percentage (%)		Average on time percentage (%)	QOS
Puchong	T600	100.00	94.78	B
		95.00		
	T604	84.21		
		89.47		
	T605	100.00		
		100.00		
Petaling Jaya	PJ02	64.52	78.49	D
		74.19		
	PJ03	77.42		
		87.09		
	PJ04	80.65		
		87.09		
Subang Jaya	T776	94.74	97.32	A
		100.00		
	T777	94.44		
		100.00		
	T778	100.00		
		94.74		
Shah Alam	T757	91.30	82.45	C
		87.50		
	T758	91.30		
		95.65		
	SA01	65.63		
		63.33		

Klang	KLG01	71.43	71.69	D
		62.50		
	KLG02	50.00		
		60.00		
	704	93,10		
		93.10		

Overall, it can be seen that Subang Jaya has a better on time performance as compared to Puchong, Petaling Jaya, Shah Alam and Klang. According to the manual, a QOS of A gives the passenger making one round trip per weekday with no transfer experiences one not – on – time vehicle every 2 weeks, while for the operator, this QOS is the best possible result that achievable by transit services operating below capacity on a grade – separated guideway not shared with non – transit vehicle, with few infrastructure or vehicle problem. As for QOS B in Puchong, by the passenger perspective will making one round trip per weekday with no transfers experiences one not – on – time vehicle every week and by operator perspective, achievable by transit services operating on a grade – separated guideway not shared with non – transit vehicle. Other than that, for QOS C in passenger perspective, making one round trip per weekday with no transfer experiences up to not – on – time vehicles every week, for operator perspective is typical range for commuter rail that shares track with freight rail and typical range for light rail with some street running or achievable by bus services in small – to mid – sized cities. Lastly, QOS D as passenger perspective, making one round trip per weekday with no transfers experiences up to three not – on –time vehicles every week or every day. Meanwhile, operator perspective is that the typical range for light rail with a majority of street running and achievable by bus in large cities.

A problem regarding the fixed timetable for the arrival of the buses was that all service operators of for five location did not publish it publicly in any form. Hence, an estimated time of arrival based on the service frequency has been used according to the arrival of the first bus at that particular stop. The on time performance was based on the time range and the definition of 1 minute early to 5 minutes late was used to evaluate the on time arrivals of the buses.

VII. ACKNOWLEDGEMENT

The authors gratefully acknowledge use of the ser-vices and facilities of the Institute of Infrastructure Energy, Universiti Tenaga Nasional funded by UNITEN BOLD UNIG Grant J510050718

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