Determination of Conventional Transportation for ADL Pathway in Malang City

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***Abstract*—The number of conventional microbus transports with passengers can be seen from the comparison between capacity in a trip t.hat is far from the capacity standard. This study uses the Work Sampling and Work Load Analysis theory to determine the optimal needs of the microbus ADL (Arjosari - Dinoyo - Landungsari) route. The study was conducted by observation and interview. The study was conducted by taking samples of microbus and microbus drivers as many as 38 unit of the total number of drivers and minibus available is 42 unit. Data collection by following the driver's activities for 5 days commuting. Record the number of passengers and the productive and non-productive time of the driver by taking into account the Performance Rating and Allowance factors and calculating the driver's workload. The results showed an average driver workload only 49 % with the current active microbus condition with total of 42 units. The researcher recommends that each minibus driver has an ideal workload of 90%, so the need for ADL line microbuses is 23 units in the hope that the number of passengers will increase.**

***Keywords*—Conventional Transportation, Number of Passengers.**

I. INTRODUCTION

CURRENTLY, conventional transportation is an aspect of public services provided by the private sector to fulfill government obligations as a public facility. Transportation is one of the important aspects in people's lives to facilitate economic, social activities, because transportation contributes greatly to community activities [1]. Public transportation is an important component in public service which is given authority for the community to support the activities of community life [2]. The existence of transportation helps the activities of the community to easily access the destination more easily and faster, especially conventional transportation because there are already routes that have been managed by the local government. The following are data on the number of conventional transport vehicles active microbuses and the number of passengers as follows Table 1.

From table 1. it can be seen the number of conventional active microbuses transport units and the number of passengers in a day in the city of Malang. From the 5 lane tables above, there is a problem between the number of conventional microbus transport units and the number of passengers using conventional microbus transport services. Line A D L Arjosari - Dinoyo - Landungsari has the least number of passengers on this route. The following is the data on the number of passengers per hour of conventional transportation of ADL line microbuses in Table 2.

From table 2, it can be seen the comparison of the number of conventional microbus transport passengers per 1 hour and the total capacity on Arjosari - Dinoyo - Landungsari (A D L) microbuses. From observations obtained an average passenger that is only 41 person while the capacity of 99 person.

Likewise, the productive time and non-productive time in the conventional A microbus transport driver line A D L. Here are the data of the productive and non-productive number of the conventional microbus transport drivers for 5 days of observation on the A D L lane as follows Table 3.

From table 3, it can be seen data on productive time and non-productive time so research is needed to be considered by the local government and the driver itself for business or work feasibility in public transportation (Microbus).

II. RESEARCH METHOD

Problem solving in this study uses the theory of Work Sampling, Work Load Analysis. Work measurement with work sampling method is a technique for conducting a large number of observations of the work activities of a machine or worker, the work sampling method has proven to be very effective and efficient to be used in gathering information about machine work or its operators [3]. Workload shows the consequences of carrying out activities given to a person / worker [4]. Workload refers to the time parameter that the percentage of effective use of work time used by workers during working hours.

Data collection in this study was done by field observations and interviews. Classifying the activities of conventional microbuses transport drivers, then calculating the amount of productive and non-productive, determining the performance rating, allowance, workload and determining the optimal amount of microbus conventional transport. Participating in driver activities for 5 working days with a sample of 38 unit microbus drivers, using the Slovin formula with error 5% of the total 42 unit microbus drivers population.

III. RESULT AND DISCUSSION

A. The number of passengers per hour of conventional transportation

The number of passengers per hour of conventional transportation of ADL line microbuses 1 = Brawijaya Camp; 2 = Gajayana Stadium; 3 = train station; 4 = Lavalet Hospital, can be seen on Table 4.

B. The results of observing activities on each conventional microbus transport.

Activity data of each work element is data that contains activities or activities of work elements carried out by

Table 1.
Number of active microbus conventional transport and the number of passengers in a day in Malang City.

NO	ROUTES	LINE	AMOUNT OF MICROLET (UNIT)	TOTAL PASSENGER (PERSON)
1.	A L	ARJOSARI – LANDUNGSARI	45	53
2.	A D L	ARJOSARI – DINOYO – LANDUNGSARI	42	41
3.	A G	ARJOSARI – GADANG	50	64
4.	A M G	ARJOSARI – MERGOSONO - GADANG	42	58
5.	A J G	ARJOSARI – JANTI - GADANG	43	57

Table 2.
Number of passengers per hour of conventional transport for ADL line microbuses.

Hour	Number of Passengers (People)	Microlet Capacity (People)
07.00 – 08.00	3	11
08.00 – 09.00	4	11
09.00 – 10.00	5	11
10.00 – 11.00	6	11
11.00 – 12.00	4	11
12.00 – 13.00	-	11
13.00 – 14.00	9	11
14.00 – 15.00	5	11
15.00 – 16.00	5	11

Table 3.
Number of productive and non-productive for 5 days.

	Aktivitas Jumlah (Kali)	Persentasi(%)
Produktive	3520	35
Non - Produktive	5790	65

conventional microbus transport drivers. From the observation of the work element activity from table 3, the observation frequency for 5 days was then grouped according to the respective work elements so that a grouping was obtained for each work element.

C. *Workload Calculation*

From the above calculation, the workload in each work element can be known as in the following calculation,

$$\text{Workload} = \frac{\text{\% Productive x Performance rating x Total minutes of observation x (1 + Allowance)}}{\text{Total minutes of observation}}$$

working hours = 10 hours
5 days = 10 x 5 x 60 minutes = 3000 minutes
Workload Driver Plate N 535 UA (Number 1)

$$\frac{40{,}82\% \; x \; 1.16 \; x \; 3000 x \; (1+0{,}35)}{3000} = 58\%$$

Workload Driver Plate N 1282 UA (Number 38)

$$\frac{35{,}51\% \; x \; 1.16 \; x \; 3000 x \; (1+0{,}35)}{3000} = 51\%$$

D. *Determination of Optimal Conventional Transportation of ADL Microbuses*

Assumption, the workload of conventional transportation drivers for microbuses is at least 90% because it is a permanent job.

$$Average\ workload\ (real\ conditions) = \frac{Workload\ Total}{number\ of\ microbus\ samples}$$

= 2054 % / 42 unit = 48,90 % = 49 %

$$\text{Average workload (Propose)} = \frac{2054\%}{90\%} = 23\ Unit$$

Based on the above calculation, the total workload of all Microbuses is 2054% and the current condition of active Microbuses with a total of 42 units has an average workload of 49 %, so the researchers recommend reducing the number of Microbuses to 23 units, so that each Microbus has a burden work on average 90%. This figure can be said to be ideal because conventional minibus transport drivers do indeed become permanent jobs, and in order to limit the granting of route licenses to conventional minibus transportation, so that the expectation to get additional passengers increases.

Table 4.
The number of passengers per stop based on the Plate Number

Stop to- Plate Number	1	2	3	4
1. N 535 UA	7	11	13	10
2. N 1202 UB	8	10	12	11
3. N 1770 UB	5	8	10	12
4. N 1185 UC	10	9	11	11
5. N 1066 UA	11	10	9	9
6. N 976 UA	13	9	11	10
7. N 1659 UA	10	9	11	11
8. N 1146 UC	11	10	9	9
9. N 778 UA	7	11	13	10
10. N 835 UA	8	10	12	11
11. N 1064 UC	5	8	10	12
12. N 1202 UD	7	11	13	10
13. N 1448 UB	8	10	12	11
14. N 1856 UB	5	8	10	12
15. N 1223 UB	10	9	11	11
16. N 1270 UD	11	10	9	9
17. N 1346 UA	13	9	11	14
18. N 895 UB	10	9	11	11
19. N 1227 UC	11	10	9	9
20. N 681 UA	12	11	13	10
21. N 1516 UA	8	10	12	11
22. N 1393 UB	5	8	10	12
23.N 1960 UA	7	11	13	10
24. N 993 UA	8	10	12	11
25. N 1886 UB	5	8	10	12
26. N 1587 UA	7	11	13	10
27. N 1782 UB	8	10	12	11
28. N 1959 UA	11	8	10	12
29. N 886 UC	10	9	11	11
30. N 1086 UB	10	13	11	11
31. N 1173 UB	11	10	9	9
32. N 1760 UA	13	10	11	10
33. N 1246 UB	10	9	11	11
34. N 1101 UA	11	10	10	9
35. N 703 UB	7	11	13	10
36. N 1172 UB	12	11	9	11
37. N 1253 UC	10	14	6	11
38. N 1282 UA	13	9	11	10

Table 5.
Observation of Plate N 535 UA (Microbus no 1)

No	Work element	Number of Activities (times)	Productivity (%)
1	Get 1 Passenger	39	15,92
2	Get 2-3 Passenger	48	19,59
3	Get 4-6 Passenger	13	5,31
4	Get 7-9 Passenger	0	0
	Productive Amount	100	40,82
	Non-Productive Amount	145	59,18
	Number of Observation	245	100,00

Table 6.
Data Calculation Results of Work Load Analysis (WLA)

No	Object of Research	Productive Percentage (%)	*Performance Rating* (P)	*Allowance*	Workload (%)
1	N 535 UA	40,82%	1,06	1,35	58%
2	N 1202 UB	37,55%	1,06	1,35	54%
3	N 1770 UB	38,78%	1,06	1,35	55%
4	N 1185 UC	33,47%	1,06	1,35	48%
:	:	:	:	:	:
35	N 703 UB	40,00%	1,06	1,35	57%
36	N 1172 UB	34,29%	1,06	1,35	49%
37	N 1253 UC	42,04%	1,06	1,35	60%
38	N 1282 UA	35,51%	1,06	1,35	51%
		Workload Total			2054%

IV. CONCLUSIONS

Based on this study, it was concluded that with a total of 42 units of operating microbuses, the workload of each Arjosari-Dinoyo-Landungsari (ADL) conventional microbus transport driver was obtained by an average of 49%.

The optimal number of conventional transportation of ADL line microbuses with the proposed workload is 90% so that the optimal number of conventional transport microbuses is 23 units and hope that the number of passengers will increase. level through external service quality improvement given to customers through improving vehicle cleanliness, punctuality in picking up, and also politeness in serving.

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