Journal of Mechanical, Civil and Industrial Engineering
ISSN: 2710-1436
DOI: 10.32996/jmcie
Journal Homepage: www.al-kindipublisher.com/index.php/jmcie

JMCIE
AL-KINDI CENTER FOR RESEARCH AND DEVELOPMENT

| RESEARCH ARTICLE

Performance Study of Buy the Service Bus Trans Metro Dewata Based on Minimum Service Standards and Balance Number of Vehicle Fleet

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| ABSTRACT
The existence of reliable public transportation services will be able to reduce public dependence on the use of private vehicles. This goal will be achieved if public transport service quality improves. The Trans Metro Dewata bus is here in Bali with the Buy The Service program. This program is to buy urban mass transportation services to operators based on the services carried out according to the kilometres travelled. The operator operates 105 buses to serve 4 corridors. Technical and operational performance shows that the indicators of travel time, headway time, waiting time, stopping time, and travel speed follow the minimum service standards and technical guidelines for urban public transport. In contrast, the circulation time in corridors 1 and 4 exceeds the standard. Likewise, the load factor level of 2.40 – 32.65% is not following the performance standards of public transportation, which should be at least 70%. This is due to route accessibility factors, route effectiveness, feeder transportation availability, the bus stop's feasibility, and the lack of socialization and information to attract people to switch to public transportation. Analysis of the balance of the number of fleets shows an oversupply of around 14.86%-33.62%. However, this condition dramatically supports bus operational performance to meet minimum service standards. So the action that must be taken to maintain operational performance and balance the number of fleets is to increase demand or the number of passengers so that the load factor reaches a minimum of 70%.

| KEYWORDS

Public Transport, Buy the Service, Load Factor, Time Headway, Travel Time

| ARTICLE INFORMATION

ACCEPTED: 20 October 2022 **PUBLISHED:** 29 October 2022 **DOI:** 10.32996/jmcie.2022.3.3.6

1. Introduction

The arrangement of the transportation system must be carried out in an integrated manner as a unified national transportation system to be able to realize the availability of transportation services that are balanced with demand, which are feasible at low costs so that they can be affordable by all people (Munawar, 2020). One aspect of transportation that concerns the lives of many people is public transportation. The development of road-based mass public transportation in urban areas in Indonesia is directed at creating reliable and affordable services for all levels of society using public transportation services (Adisasmita, S.A, 2014). In the long term, it is hoped that the existence of reliable public transportation services will be able to reduce people's dependence on the use of private vehicles. This goal will be achieved if public transport service quality improves (Minister of Transport London, 1998).

One of the facilities being developed to fulfil the need for public and tourist transportation is the Trans Metro Dewata BRT operation. The operator operating the Trans Metro Dewata service in Bali is PT. Satria Trans Jaya. This Bus Rapid Transit (BRT) transportation supports the mobilization of the Balinese people, especially the Denpasar area and its surroundings which are connected to Ngurah Rai International Airport, as well as other terminals and cover areas outside Denpasar City such as Badung, Tabanan, and Ubud (Hermawati et al., 2021). Trans Metro Dewata operator prepares 105 buses by operating 95 buses and ten

reserves to serve four corridors. The operation of Trans Metro Dewata is carried out from 04.30 to 21.00 WITA (Bus.Com Friends, 2022).

However, after two years of operation, the existence of the Trans Metro Dewata Bus has not been able to attract public interest to use public transportation. In field operations, even though passengers do not pay, the bus load rate is less than 30%, and sometimes some buses pass without passengers in a corridor. The realization of bus arrivals at the bus stop every 7 minutes also becomes about 15 minutes. In this study, the performance of the buy-the-service program will be studied by analyzing the balance of the number of fleets that must be provided in each corridor to suit the needs of passengers (Taufanudin MS. et al., 2021) and meet minimum service standards for load factor parameters. , the time between (headway time), frequency, and speed.

2. Methodology

In this study, the performance of buying the service will be studied, and analyze the balance of the number of fleets that must be provided in each corridor to suit passenger needs and Minimum Service Standards (Adris AP, 2013). The research was conducted by collecting data along four corridors of the Trans Metro Dewata bus operational routes, including:

- Corridor 1; Kuta Badung Parking Center – Tabanan Preparation Terminal
- Corridor 2; GOR Ngurah Rai – Ngurah Rai Airport
- Corridor 3; Ubung Terminal – Sunrise Beach
- Corridor 4; Ubung Terminal – Monkey Forest Parking Center

The main instruments in this study were a survey form and a list of structured interview questions for buying the service performance for the parameters of travel time, downtime, waiting time, headway time, and passenger load factor (Susilowati et al., 2011). Data were obtained from two main sources: primary and secondary.

Primary data on the performance of the Trans Metro Dewata bus consists of the following:

1. Load factor data

Data retrieval of passengers up and down is carried out on Monday - Sunday with Surveyors conducting surveys on the bus, passing the departing and returning routes.

2. Time data between

Intermediate time data collection is carried out by observing at an observation point, for example, at a bus stop/shelter.

3. Travel time, downtime, and waiting time data

This data retrieval is carried out on the bus by recording the travel time of the bus between the stops/shelters that are passed. Then the waiting time is recorded for passengers at the starting and ending terminals of the route.

While secondary data is obtained from previous research and reports/studies from related agencies, the secondary data includes the Buy The Service system, bus specification data, bus route maps, and bus departure schedules in all corridors.

3. Results and Discussion

3.1 Profile of Trans Metro Dewata Mass Transportation

In its operation, each bus in all corridors averages 4 – 6 trips per day depending on the track's distance and the traffic density challenges in each route traversed. Trans Metro Dewata operates with 105 fleets, with details of 95 fleets used for operational purposes, while the remaining ten are for reserves. The passenger capacity is 18 seats and 20 hand grips for standing passengers, and two places for the disabled, pregnant women, and the elderly. The number of bus stops and bus stops that TMD Bus stops in its operation in each corridor ranges from 30 to 68 stops for one round trip.

3.2 Buy The Service System

In Indonesia, subsidies are guaranteed in transportation regulations to encourage the role of public transport in urban areas. Still, the government's budget constraints encourage the development of the concept of purchasing services through a new method, namely, buying the services. Buy the service (BTS) is a system that can be applied to operate buses with service specifications in terms of quantity and quality. The government will pay operators based on tariffs for the services they perform, according to the number of kilometres they travel (Prayudyanto NM, 2021). The BTS scheme is designed to prioritize existing operators. Still, these operators must be able to comply with the minimum service standards (SPM) that have been set and meet the requirements of the auction. In the implemented service purchase system, purchases are made with a calculation based on the basic cost

formulation, which will produce a value of rupiah per kilometre. Thus, the operator will be paid fixedly based on the value of travel in rupiah per kilometre. The purchasing system by the government is stated in the form of a contract. The contract contains standard operating procedures (SOPs) that regulate various matters, such as rights and obligations, operating procedures, schedules, transportation specifications, and other agreements. The TMD Bus fare itself is still free until now.

3.3 Performance Analysis

Analyzing the performance and service of the Trans Metro Dewata Bus refers to the Regulation of the Minister of Transportation of the Republic of Indonesia No. PM 29 of 2015 (Dep. of Transportation, 2015) and No. 98 of 2013 (Dep. Transportation, 2013) concerning the minimum service standard for transporting people with public motorized vehicles on the route. The parameters analyzed are contained in the Decree of the Directorate General of Land Transportation No. SK.687/AJ.206/DRJD/2002 (Dep. Transportation, 2002) covers travel time, headway time, downtime, speed, and load factor, with typical values as shown in Table 1.

Table 1. Standards of Performance Indicators according to the Technical Guidelines of the Ministry of Education. Communication

No	Performance Indicator	Ministry of Transportation Technical Guidance Standard
1.	Traveling time	60-90 minutes
2.	Circulation Time	80-180 minutes
3.	Intermediate Time (Head Way)	Max 15 minutes (peak) & 30 minutes (non peak)
4.	Downtime & Waiting Time	Max 15min
5.	Speed	20-30 Km/Hr
6.	Load factor	Min 70%

3.3.1 Travel time

Travel time is the total time required, including stopping time at the bus stop or bus stop. The travel time is very relative because it is influenced by vehicle speed, route length, and the density level of the route traversed. The total travel time per kilometer on both routes for each corridor on weekdays and holidays is shown in Table 2.

Table 2. Travel Time per Kilometre in Each Corridor

No.	Corridor and Route Name	Track Length (KM)	Travel Time (Minutes/Km)	
			Working Days	Holidays
1	Corridor 1			
	Kuta Central Parking Route – Pesiapan Terminal	30,22	2,85	2,52
	Pesiapan Terminal Route – Central Parking Kuta	30,39	2,94	2,72
2	Corridor 2			
	GOR Ngurah Rai route – Ngurah Rai Airport	17,76	2,59	3,01
	Ngurah Rai Airport Route – GOR Ngurah Rai	15,54	3,82	4,02
3	Corridor 3			
	Ubung Terminal Route - Sunrise	12,44	2,82	2,74
	Sunrise Route - Ubung Terminal	19,83	3,04	3,34
4	Corridor 4			
	Ubung Terminal Route – Ubud Monkey Forest	31,30	2,66	2,82
	Ubud Monkey Forest - Ubung Terminal	30,49	3,04	3,10

3.2.2 Circulation Time

Circulation time is the travel time required by the bus to traverse along the route from point (A) to the end point (B) and then back to the starting point (A). Circulation time is determined from travel time, time deviation of 5% of travel time, and stopping time of 10% of travel time between A and B. In the TMD Bus circulation time analysis, travel time and stop time are used according to operational realization in the field and a time deviation of 5% of the travel time according to the standard in the technical guidelines. The lowest TMD bus circulation time is 100.17 minutes in corridor 1, while the longest circulation time is in corridor four at 191.98 minutes. However, in terms of circulation time per kilometre in all Trans Metro Dewata bus corridors, it ranges from 2.75 to 3.66 minutes/kilometre.

3.3.3. Time Headway

Time Headway is the departure interval between one bus and the next, calculated in time units at a certain point on each route. Time headway between vehicles is an important performance factor that affects safety, service level to passengers, and driver behaviour. The absolute value of the TMD Bus headway time can be seen in Table 3.

Table 3. Average Headway Time in Each Corridor

No.	Corridor and Route Name	Number of operating Fleet (Units)	Headway Time (Minutes)	
			Working Days	Holidays
1	Corridor 1			
	Kuta Central Parking Route – Pesiapan Terminal	22	10,26	10,19
	Pesiapan Terminal Route – Central Parking Kuta		10,43	10,38
2	Corridor 2			
	GOR Ngurah Rai route – Ngurah Rai Airport	15	10,12	10,04
	Ngurah Rai Airport Route – GOR Ngurah Rai		10,15	10,08
3	Corridor 3			
	Ubung Terminal Route - Sunrise	15	9,99	10,10
	Sunrise Route - Ubung Terminal		10,06	10,42
4	Corridor 4			
	Ubung Terminal Route – Ubud Monkey Forest	22	10,35	10,12
	Ubud Monkey Forest - Ubung Terminal		10,28	10,25

3.3.4 *Travel Time*

In Trans Metro bus operations in the four corridors, travel speed depends on the track distance and travel time of each route, which can be seen in full in Table 4. According to the actual travel speed, it is still within the minimum speed limit of the standard speed of urban public transport (Ministry of Transportation, 2002), which ranges from 20-30 km/hour. However, the travel speed in all corridors still needs to be improved by eliminating travel barriers, especially due to traffic.

Table 4. Travel Speed in Each Corridor

No.	Corridor and Route Name	Track Length (km)	Travel Time (hour)		Travel Speed (Km/hour)	
			Working days	Holidays	Working days	Holidays
1	Corridor 1					
	Kuta Central Parking Route – Pesiapan Terminal	30,22	1,44	1,27	21,06	23,77
	Pesiapan Terminal Route – Central Parking Kuta	30,39	1,49	1,38	20,43	22.06
2	Koridor 2					
	GOR Ngurah Rai route – Ngurah Rai Airport	17,76	0.77	0,89	23,21	19,93
	Ngurah Rai Airport Route – GOR Ngurah Rai	15,54	0,99	1,041	15,72	14,93
3	Corridor 3					
	Ubung Terminal Route - Sunrise	12,44	0,59	0,57	21,24	21,91
	Sunrise Route - Ubung Terminal	19,83	1,00	1,10	19,74	17,97
4	Corridor 4					
	Ubung Terminal Route – Ubud Monkey Forest	31,30	1,39	1,47	22,52	21,25
	Ubud Monkey Forest - Ubung Terminal	30,49	1,55	1,57	19,72	19,37

3.3.5 Load Factor

Load Factor is a quantity that states the ratio between the number of passengers transported and the vehicle's capacity. According to the Decree of the Director General of Land Transportation on urban public transportation (Dep. Transportation, 2002), the load factor for buses to operate independently without subsidies is at least 70%. Load factor analysis is intended to measure the capacity of passengers each time on a trip so that it can be known whether each vehicle from each route can carry passengers at its maximum capacity. High and low load factor values have an inverse relationship between service users and operators (Jen hellekesa et al., 2021). When viewed from the interests of the service user community, a low load factor will be pleasant because the service user community is freer to use their seats. However, for transportation service entrepreneurs, the low load factor will be detrimental to them because the carrying capacity of each route/route is not optimal. To perform a load factor analysis, it is necessary to record passengers who disembark and passengers who board (Shuhairy N et al., 2019). The results of the load factor analysis on weekdays and holidays can be seen in Tables 5 and 6.

Table 5. Average Load Factor in Each Corridor (Working Day)

No.	Corridor and Route Name	Number of operating fleets (Units)	Load Factor average weekdays (%)			
			Morning	Afternoon	Evening	Night
1	Corridor 1					
	Central Parking – Pesiapan Terminal	22	8,47	3,70	3,97	18,92
	Persian Terminal – Central Parking		19,90	9,10	8,20	3,20
2	Corridor 2					
	GOR Ngurah Rai–Ngurah Rai Airport	15	16,20	18,76	18,88	15,97
	Ngurah Rai Airport–GOR Ngurah Rai		9,83	22,51	5,13	8,40
3	Corridor 3					
	Ubung Terminal Route - Sunrise	15	9,62	29,12	3,30	2,75
	Sunrise Route - Ubung Terminal		8,57	6,96	3,39	4,82
4	Corridor 4					
	Ubung Terminal–Monkey Forest Ubud	22	4,19	15,15	9,73	8,99
	Ubud Monkey Forest- Ubung Terminal		11,35	10,59	4,08	9,57

Table 6. Average Load Factor in Each Corridor (Holidays)

No.	Corridor and Route Name	Number of operating fleets (Units)	Load Factor average weekdays (%)			
			Morning	Afternoon	Evening	Night
1	Corridor 1					
	Central Parking – Pesiapan Terminal	22	2,40	16,30	6,00	30,70
	Persian Terminal – Central Parking		10,40	18,00	9,70	6,20
2	Corridor 2					
	GOR Ngurah Rai–Ngurah Rai Airport	15	28,09	21,68	8,51	3,85
	Ngurah Rai Airport–GOR Ngurah Rai		37,18	21,79	4,70	22,51
3	Corridor 3					
	Ubung Terminal Route - Sunrise	15	28,30	25,00	15,11	9,62
	Sunrise Route - Ubung Terminal		15,71	22,50	12,86	35,36
4	Corridor 4					
	Ubung Terminal–Monkey Forest Ubud	22	7,51	7,88	15,39	20,20
	Ubud Monkey Forest- Ubung Terminal		4,72	22,07	24,87	32,65

Based on the load factor data on all routes, as shown in Tables 3.6 and 3.7, all corridors still show a meagre figure of 2.40-32.65%, which is much lower than the Ministry of Transportation standard for public transportation in urban areas of at least 70%; To be able to operate independently.

Of the six indicators, it shows that travel time, headway time, waiting time, and stopping time, as well as travel speed, are following the minimum service standards and technical guidelines for urban public transport in fixed and regular routes determined by the Ministry of Transportation of the Republic of Indonesia. Still, the circulation time is longer than the standard. Furthermore, the low

passenger load factor does not meet the standard of occupancy for public transport, which should be at least 70%, to meet the standards in terms of passenger comfort and the business of public transport operators.

3.4 Fleet Balance Analysis

Users of public transport vehicles require an adequate level of service, both travel time and waiting time, as well as guaranteed safety and comfort during the trip. This demand can be met if the provision of the public passenger transportation is balanced with the demand for public transportation services. The number of "right" fleets according to needs is difficult to ascertain, but what can be done is the number of fleets close to the need's magnitude. This uncertainty is caused by the uneven pattern of people's movements over time, for example, during peak hours of high demand and low-demand hours of low demand.

The analysis of the number of fleets is calculated for weekdays and holidays, and the number is compared with the number of fleets currently operating. The results of the analysis of the balance of fleet needs are shown in Table 7.

Table 7. Results Analysis of the Balancing on the Number of Fleet Needs

Location	Circulation Time (Minutes)	Headway (Minutes)	Fleet Requirement (Unit)	Number of Operating Fleet (Units)	The difference in Fleet Number (Units)
Working days					
Corridor 1	184.11	10.43	18	22	4
Corridor 2	110.49	10.15	11	15	4
Corridor 3	100.17	10.06	10	15	5
Corridor 4	184.98	10.35	18	22	4
Holiday					
Corridor 1	166.88	10.38	16	22	6
Corridor 2	121.72	10.08	12	15	3
Corridor 3	105.32	10.42	10	15	5
Corridor 4	191.98	10.25	19	22	3

The analysis results in Table 7 show a difference in the number of fleets needed with the number of operating fleets of around 3 to 6 or around 14.86%-33.62%. This condition does indicate that the number of operating fleets is not balanced with the amount of passenger demand (oversupply). Still, the number of operating fleets greatly supports the operational performance of TMD buses to meet the minimum service standards following the provisions of the Ministry of Transportation. So the action that must be taken to maintain good bus operational performance and balance the number of fleets is to increase demand or the number of passengers so that the load factor reaches a minimum of 70%. So there must be marketing efforts and socialization of public transportation that needs to be done by operators and the Government to increase the Load Factor. For this reason, it is hoped that in the buy-the-service agreement, the Government will add load factor requirements to operators and not only based on the distance travelled by each fleet.

4. Conclusion

Referring to the results of the analysis that has been carried out and discussed, the conclusions drawn from this study are as follows:

1. Technical operational performance shows that travel time indicators are 57.46 - 85.38 minutes, headway is 10.06-10.43 minutes, waiting time and stop time is 4.20 - 8.43 minutes, and travel speed is 19.93 – 23.77 km/hour is following the minimum service standards and technical guidelines for urban public transportation determined by the Ministry of Transportation of the Republic of Indonesia. In comparison, the circulation time in corridor one and corridor 4 is 185 minutes and 191 minutes exceeds the standard that should be a maximum of 180 minutes. Likewise, the passenger load factor of 2.40 – 32.65% has not yet achieved good public transport performance, which should be at least 70%. This is due to several factors, such as route accessibility, route/path effectiveness, availability of feeder transportation, and bus stop feasibility. Lack of socialization and information to the user community and potential users attracts public interest in switching to public transportation.

2. Analysis of the balance of the number of fleets shows a difference in the number of fleets needed with the number of operating fleets of around 3 to 6 or around 14.86%-33.62%. However, the condition (oversupply) supports bus operational performance to meet minimum service standards and technical guidelines for urban public transport. So the action that must be taken to maintain the good operational performance of buses in the four corridors and balance the number of fleets is to increase demand or the number of passengers so that the load factor reaches a minimum of 70%. It recommended joint efforts by the Government and operators to increase the number of passengers through marketing, socialization, and providing information to schools, universities, Government, and private offices as well as through mass media/TV/Radio.

4.1 Suggestions

The use of ICT has a significant effect on the process and learning outcomes at LPK Mandiri Snur Bogor by emphasizing the importance of the characteristics of students having a significant effect on the process and quality of learning outcomes. The use of ICT has a significant effect on the process and learning outcomes in LPK, and the process and results of the use of ICT have a significant effect on the quality of the use of ICT in learning at LPK Mandiri Snur Bogor. The research results can be input for the government, academics, trainers, students, and the community, in general, to create a similar community in promoting the use of ICT, which has a significant effect on the quality of learning at LPK Mandiri Snur Bogor.

Funding: This research received no external funding.
Conflicts of Interest: The authors declare no conflict of interest.
Publisher's Note: All claims expressed in this article are solely those of the authors and do not necessarily represent those of their affiliated organizations, or those of the publisher, the editors and the reviewers.

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