

Does Continuous Improvement Can Push BRT Ridership? (Case study of BRT TransJakarta)

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Abstract

Bus Rapid Transit (BRT) has been one of the most popular transit mode which provides fast and easy access to meet the transportation needs in developing country. It offers the opportunity to create a high-quality mass transit system at affordable cost, which is particularly important for developing countries. Despite of many BRT systems have been implemented in various cities in developing countries, there are a limited number of studies exploring how to increase BRT's ridership. The main goal of this study is to gain insights of Transjakarta and DKI Jakarta's government strategy to improve the BRT performance. It is important to examine the Transjakarta dan DKI Jakarta's government implemented strategies of BRT system along with the policy reforms analysis that affects the ridership. Furthermore, this study also intends to enhance the understanding of the underlying acts that may influence on BRT ridership. Therefore, these act forms can be used as a benchmark for implementing BRT systems in other cities in Indonesia. For this purpose, conceptual frameworks, explaining the relationship between the daily BRT ridership and the potential factors, are developed using information collected from the operational of TransJakarta. This study captured the ridership patterns and data during the last 3 years, from 2017 to 2019. Transport integration as well as increasing network and number of fleets are found to be the main factors which can boost the ridership. In addition, the research presents some inputs to formulate some development strategy for operating BRT which can be applied in other cities, especially in Asia.

Keywords :

BRT, Ridership, TransJakarta

1. Introduction

One of the options for the improvement of public transport system functioning and the quality of this service is so-called Bus Rapid Transit (BRT), which is usually integrated into transportation system of the city together with other support measures, such as infrastructure for Non-Motorized Transport (NMT). BRT is a system operating on its own right-of-way either as a full BRT with high quality interchanges, integrated smart card fare payment, and efficient throughput of passengers alighting and boarding at bus stations; or as a system with some amount of dedicated right-of-way (light BRT) and lesser integration of service and fares. The system was first introduced in 1973 in Curitiba (Brazil). BRT offers the opportunity for developing cities to create a high-quality mass transit system at affordable costs (Wright, 2005). Nowadays, BRT is active in 173 cities all over the world and serves about 34 million daily passengers (Global BRT Data, 2020).

BRT Jakarta was firstly initiated in 2003 by the Governor of Jakarta which served the first corridor from commercial hub Blok M in the south of the central city to Kota, the old city in the north (Sayeg, 2015). The BRT system is known as TransJakarta which operated by an agency of the Government of Jakarta under same name although infrastructure and buses are procured by the Transportation Department. There were 15,9 million passengers travelled using the system during the first year of operation (approximately 44,000 passengers per day) (Joewono et al., 2012). After fifteen years, the routes of TransJakarta have grown into thirteen corridors with a total length of 229,1 km and 264,6 million passengers (MRT Jakarta, 2019). During those period, TransJakarta has always been improved its service towards various aspects until reach approximately 940,000 daily passengers in early 2020.

The existence of TransJakarta is relevant to people's needs regarding mobility. Previous study found that the reliability of TransJakarta has already passed the minimum service standards with the overall quality service analysis based on TransJakarta user's perception was not all bad (Sophie & Tangkudung, 2011). There were several studies which also tried to explore the service quality of TransJakarta by using its customer perceptions

(Joewono et al., 2012);(Silaningsih et al., 2015). As the first public transportation system subsidized by the government, TransJakarta is proof that regional government can contribute in managing public transportation. Besides, TransJakarta is also achieved many significant achievements which can be a benchmark for BRT system implementation in other cities such as Semarang and Medan (Sinaga et al., 2019).

High service levels, in terms of frequency and span of hours covered, were found to be driver factor of patronage on all public transport modes (Currie & Delbosc, 2013). Besides, density was also mentioned as primary determinant of transit ridership (Johnson, 2003) cited in (Currie & Delbosc, 2013)). Despite growing popularity of BRT systems in developing countries, there is a relative lack of detailed research on the successfulness of these systems which effectively increase the ridership. This study intends to extend various acts which can affecting BRT ridership on a system level by using TransJakarta case. For this purpose, qualitative approach is employed to explain potential factors such as transport policy and system performances which influence daily BRT ridership. The results are expected to help policymakers build successful BRT systems, as well as become benchmark for BRT implementation in other cities, particularly in Asia.

2. Methodology

There are several stages which need to be followed in conducting this study. At first, after identifying and constructing several problems in case study, literature review process was carried out in order to narrow the scopes as well as determine the main objectives of this study. On the second stage, there was a process in data collection which consist of regulatory framework relate to public transport supply, history of TransJakarta development, and performance conditions of TransJakarta during the last 3 years. In the further stage, data compilation and analysis were done by using qualitative approach. By employing this approach, this result of this study can be more intensive and comprehensive. In the process, we synthesized the variable of system development in TransJakarta operational and the performance. The findings were compiled as several key factors which could effectively increase the performance of TransJakarta, particularly the ridership.

3. Results and Discussion

3.1. DKI Jakarta Public Transportation Services

As Indonesia's capital, Jakarta's Special Capital Region (DKI) is the center of government as well as the center of economic activities. The population in 2018 was 10.47 million people (Jakarta Central Statistics Agency - BPS), excluding areas around Jakarta such as Bogor, Depok, Tangerang and Bekasi, which make up the Greater Jakarta (Jabodetabek) area. The government is pursuing a megapolitan concept for Jabodetabek by encouraging integration of the five regions.

Jakarta's progress as a capital has seen an increase in population density and congestion. Based on BPS data, motorized vehicles in Jakarta are dominated by private vehicles, namely motorbikes and passenger cars. In 2016, the overall number of vehicles reached 18,006,404 units, and consisted of 13,310,672 motorbikes, 3,525,925 passenger cars, 689,561 goods vehicles, 338,730 buses, and 141,516 special vehicles. The growth of motorized vehicles is not proportional to the length of roads owned by Jakarta. Based on its type, the longest road is an administrative city road with a total length reaching 4,949.68 km; followed by provincial roads along 1,483.08 km consisting of secondary arteries and secondary collectors of 694.46 km and 788.62 km respectively; while 59.86 km of national roads consist of primary arteries and primary collectors of 57.70 km and 2.16 km respectively, followed by the last 160.35 km of toll roads. With a high number of motorized vehicles that are not accompanied by growth in the number of road lengths, Jakarta should be aware of congestion as a factor that can actually hamper its economic growth. The government has pursued a number of policies such as 3 in 1 and even odd policies in several strategic locations, hoping to reduce the interest of motor vehicle users to use their private vehicles.

In line with several push measures approach, the government also encourages appropriate and affordable public transportation for the people of Jakarta. Several public transport infrastructures have been in operation several years while the other are operating last year, such as MRT and LRT. Those modes help in connecting Jakarta main core area with its peripheral districts. The characteristic of public transport which serves Jakarta and its metropolitan area is summarized in Table 1.

Table 1. Transportation Services in Jabodetabek Area

Aspect	TransJakarta	KCI Commuter Line	MRT	LRT Jabodetabek	LRT Jakarta
Network Length	231 km	235 km	10 km elevated and 6 km underground	43 km	5,8 km
Station	262	80	1	41	5
Corridor/Line	13	6	1	3	1
Route	153	n/a	n/a	n/a	n/a
Operational Time	24 hours	04.30 – 00.00	05.00 – 00.00	n/a	n/a
Duration	24 hours (except corridor 4, 11, and 12)	19,5 hours	19 hours	n/a	n/a
Headway	5 – 30 minutes	5 – 15 minutes	5 minutes	3 minutes	n/a
Fleet Capacity	40 – 140 passengers	200 passengers	200 passengers	135 passengers	135 passengers
Number of Carriages	n/a	4/6/8/10/12	6	3/6	2
Daily Passenger	721.000	1 million	135.000	300.000	15.000
Target	1 million	1,2 million	135.000	500.000	n/a

Source: ITDP, 2019

3.2. BRT Around the World

The experience of modern flagship BRT in Curitiba and Bogota has boosted the subsequent introduction of BRT in Asia, including China. Guangzhou BRT is mentioned as a high profile BRT system in China which achieved the highest capacity in terms of both ridership and peak-hour frequency (Deng et al., 2013). In addition, Guangzhou BRT is also operated by seven bus operators, in which no other BRT system implement such scheme. Meanwhile Guangzhou BRT, as one of BRT system with biggest capacity in the world, have the most frequent bus from all BRT system, with 350 bus per hour and carry 850 thousand passengers per day. However, according to Velásquez et al. (2017), there were 11 indicators which Chinese BRT system has lower scores than other BRT over the world. These indicators are intersection treatment, limited-stop services and passing lanes, minimum station setback lengths, high quality BRT in multiple high-demand corridors, and distance between stations.

It is well-known that BRT is widely used in South America. TransMilenio in Bogota, Colombia carried about 37 thousand passengers per hour. Since its first operation in 2002, the system was planned to be a full BRT network. TransMilenio BRT system consists of several interconnected BRT lines which by 2012 had 12 lines running through the city. This BRT was recognized as the busiest BRT system in the world which carrying more than 250.000 passengers per hour and even become one of BRT system who hold Gold rating according to the 2013 BRT Standard (<https://inclusiveinfra.gihub.org/>). In order to compare the characteristics and performance of BRT around the world, we summarized several BRT system characteristics in Table 2.

Table 2. Comparison of BRT in the World

Variables	TransJakarta	TransMilenio	Guangzhou	Metrobus	BRT Rio
System length in km	251,2	112,9	22,9	54,5	168
Daily passengers in million	0,37	2,2	0,85	1,4	3,5
Corridor	13	11	1	8	17
Number of stations	260	139	26	109	240
Fare in US dollar	0,25	0,67	0,31	0,37	1,03
Start operation	2004	2000	2010	2011	2011
Location	Jakarta	Bogota	Guangzhou	Buenos Aires	Rio de Janeiro
Population	10.562.088	8.181.047	6.780.000	2.891.082	6.476.631

Source: Global BRT Data, 2020

3.3. TransJakarta Milestones on Service Improvement and Performance

TransJakarta was firstly initiated in 2004, which then officially operated since February, 2004. It was the first BRT system in Southeast Asia, who has a rapid transit based transportation system with the longest network in the world (about 208 km). TransJakarta BRT was designed to adapt the system operated by TransMilenio, Bogota, Colombia. During 2004-2006, according to Governor Decision of DKI Jakarta No. 110 Year 2003, TransJakarta is under Operating Agency (BP) TransJakarta form which managed in non-structural basis. In 2006, TransJakarta was changed to Public Service Agency (BLU) TransJakarta in which a Technical Implementation Unit (UPT) under Transportation Department of DKI Jakarta as stated in the document of Governor Decision of DKI Jakarta No. 48 Year 2006. BLU was responsible for the operational including planning, operating, and maintaining.

TransJakarta continued their service improvement through its operational year. They expanded networks by opening Corridor 9 (Pluit – Pinang Ranti) and Corridor 10 (PGC Cililitan – Tanjung Priok) in 2010. Afterwards, in 2011, TransJakarta implemented an integrated fleet management system which allowed them to be integrated with regular bus operator in providing busway feeder services for its passengers. In this year, the opening for Corridor 11 and Corridor 12 services has been prepared.

Year of 2013 has become preparation period for TransJakarta in opening new corridors. Moreover, in this year, e-ticketing system with busway feeders and other public transport modes was also implemented. This improvement has impacted on increasing passenger convenience in making purchase of ticket transactions. In addition, direct service concept which suggested by ITDP since 2013 to overcome the problem of low number of passengers as well as route flexibility, can significantly improve route services without additional infrastructure development outside the busway corridor. A year later, TransJakarta became Regional Owned Enterprises (BUMD) and officially renamed as PT. Transportasi Jakarta. The service improvement towards both technical and operational aspects always done each year. Even in April 2016, TransJakarta officially operated female buses on their several corridors to support equality in public transportation services. Furthermore, TransJakarta launched new buses with low entry design to ease the passengers when boarding.

According to MRT Jakarta (2019), TransJakarta served 247 number of routes which increase of 91 routes from previous year (58,22%). The number of fleet as end of 2019 was 3.435 units, which experienced an increase of 71,41% from former year. The improvement in operational aspects as well as the expansion of outreach had a positive impact on TransJakarta passenger growth. Compared to 2018 with 188,9 million

passengers, the number of passengers throughout 2019 increased by 40,04%. This growth rate is higher than previous year increase with only 30,45%.

According to ITDP Report (2019), integration of TransJakarta with medium bus operators, was mentioned as an initiated factor for the increasing trend of passengers. Since service integration with medium bus operators at the end of 2015, the increasing number of annual passengers reached 54%. With number of passengers as 189 million in 2018, TransJakarta has become the main backbone for Jakarta mobility. Meanwhile, regarding the daily passenger, there are also continuous increase up to 120% since initiated integration with medium bus operators at the end of 2015. Even in 2019, TransJakarta reported their achievement on daily passenger record for serving 997,2 thousand passengers per day (PT. Transportasi Jakarta, 2020). It was mentioned that the target for serving one million passengers in 2019 can be performed by TransJakarta with the efforts of service improvements, route additions, service integration with other public transport modes (angkot, commuter line, MRT, and LRT).

Despite of many achievements, there are still a lot of works which needs to be done by TransJakarta in order to improve the services. There are several recommendations which proposed through ITDP Report (2019) as below :

1. Become the leading of Jakarta transport integration system with road-based public transport (small and medium buses) and rail-based public transport (commuter line, MRT, and LRT) public transport service;
2. An inclusive public transport infrastructure, particularly for vulnerable groups;
3. Sterilize TransJakarta lane which is the one of the main key success for TransJakarta operational;
4. Expand TransJakarta service range, where currently have only managed to reach around 60% of Jakarta total population. Therefore, it is expected that TransJakarta can reach more passengers by making integration with small bus operators and opening new routes in the areas without public transport accessibility; and
5. Resolving the first and last mile problems by ensuring that people have good access for reaching the nearest bus stops and using TransJakarta services.

The income from public transportation services is revenue from the sale of tickets in accordance with passenger transportation rates which listed in the document Governor's Decree Number 1912 Year 2005 about the determination of public bus and TransJakarta busway passenger transportation fare in DKI Jakarta. Based on the document, TransJakarta fare is IDR 2.000 (USD 0.16) for operational from 05.00 am to 07.00 pm and IDR 3.500 (USD 0.28) for operational after 07.00 pm. However, this flat fare system attracts long distance passenger, while most of the short distance passengers tend to choose a less cost and faster mode such as paratransit.

To support service integration, according to the Governor Regulation of DKI Jakarta Number 97 Year 2018 about Integrated Public Transportation Passenger Fee in the Bus Rapid Transit System, for the use of two or more public transport services in the BRT system, an integrated fare is applied, in which the amount will be maximum IDR 5.000 per trip period for 3 hours, which start from the first vehicle card reading to the last vehicle card reading. This integrated rate applies to OK Trip/JakLingko electronic money cards.

The operation of TransJakarta is funded from ticket sales and government subsidy. The revenue from ticket sales is managed by the operator, PT. TransJakarta. However, the revenue is still insufficient to cover the operating cost and other expenses. The government of DKI Jakarta provides subsidy for public transportation services through the provider company. The procedure for calculating the subsidy in 2019 was based on the Governor Regulation of DKI Jakarta Number 62 Year 2016 about Obligations of Public Services and Provision of Subsidies Sources from the Regional Revenue and Expenditures Budget to Jakarta Transportation Limited Companies. According to these regulations, the company have signed an agreement with government of DKI Jakarta regarding the implementation of Public Service Obligation (PSO) for TransJakarta services.

In the aspect of service range expansion, the company has conducted route expansion, physical integration enhancement, and payment integration. To support the integration, in 2019, TransJakarta developed three integration points which are Bundaran HI station in which physically integrated with MRT mode, Pemuda Rawamangun station in which physically integrated with LRT Velodrome station, and Tosari station in which integrated with Dukuh Atas transit area. Until the end of 2019, TransJakarta served 247 routes, which experience increase of 58,33% from previous year which only 156 routes. Besides, the number of TransJakarta fleets is 3.435 in the end of 2019, which increase about 71,41% from previous year.

The expansion of the Company's outreach has an impact on the affordability of Transjakarta services for the people of Jakarta. Until the end of 2019, it was noted that as many as 8.3 out of 10 residents of DKI Jakarta had access to use Transjakarta. Based on the criteria where the transit point is 500 meters from the settlement via the Small Bus service, Transjakarta services have covered the Jabodetabek area of 584.8 km² and can serve approximately 83% of the total population of DKI Jakarta.

Year 2019 is an integration year for public transportation in DKI Jakarta. With the release of two new modes, which are MRT and LRT, all sectors expect significant improvements of public transport quality which

then result on an increase of ridership. At the early period of operational, the issue of service ineffectiveness, especially between Transjakarta Corridor 1 and MRT Jakarta, emerged. With good communication between the two parties at both the management and work team levels, the Company and MRT Jakarta have made this problem an opportunity to integrate public transportation. At that time, Indonesia Railway Station Company (PT. KAI), PT. MRT Jakarta, and Department of Transportation DKI Jakarta signed an agreement for setting up integrated station in order to increase the number of passengers as well as boost mobility level in Jakarta Metropolitan Area by optimizing commuter line, MRT, and TransJakarta. As a result, after integration efforts through more than 15 routes, physical integration at bus stops and stations and pedestrianization, they succeeded in increasing their ridership.

Based on Ismiyati et al. (2016) the reliability of TransJakarta services can be measured through 7 indicators which are :

- 1) Headway plan, which no more than 10 minutes during peak hour for low demand corridor and 5 minutes for high demand corridor;
- 2) Headway accuracy;
- 3) Time for passenger alight is 20 seconds in maximum;
- 4) Distance between fleet door and shelter is not more than 200 mm;
- 5) Travel speed is not more than 15 km/hour;
- 6) Fleet reliability with minimum operational rate 90%; and 7) Service hours consistency.

One of the benchmarks for the success of the Transjakarta management is the Minimum Service Standards (SPM) which refers to the Regulation of the Governor of DKI Jakarta Province No. 13 of 2019 concerning Amendments to Governor Regulation No. 33 of 2017 concerning Minimum Service Standards (SPM) of Transjakarta Public Transport Services. Table 3 show the resume of SPM regulation and TransJakarta service achievement report based on their report performance in 2019.

Table 3. Minimum Services Standard for TransJakarta Services and Their Achievement

No	Type of Basic Services	Details	Minimum Standard	Service Achievement Report
Security				
1	Shelters and its support facility	Security guard	2 people for Shelter type A 1 people for Shelter type B	100%
		Security compromise information	Minimum 2	100%
		CCTV	Minimum 1	90%
	Bus fleet	Fleet identity	Minimum 3 LED and number in fleet body	100%
		Driver identity and fleet officer uniform	Driver identity and uniform for fleet officer	100%
		Emergency signal light	1 unit	100%
		Fleet officer	1 people per bus	100%
	Darkness of window glass	Maximum 60%	100%	
	CCTV	1 unit	100%	

No	Type of Basic Services	Details	Minimum Standard	Service Achievement Report
Safety				
2	Passenger	Fleet operational procedure	Availability of operational procedure on board and implementation of the procedure by the driver	100%
		Emergency handling procedure	Availability of operational procedure on board and implementation of the procedure by the driver	100%
		Driver break time	Minimum 30 minutes	100%
	Bus fleet	Vehicle eligibility	Vehicle eligibility test result	100%
		Safety equipment	2 pieces of glass-breaking hammer, 1 fire extinguisher, 1 automatic button for opening door, 1 flashlight	100%
		Health facility	Health equipment	100%
		Information call number	2 pieces on board and 1 piece outside the bus	100%
		Grip facility for standing passengers	Availability according to bus technical specifications and work properly	100%
		Enter and exit door for passengers	Door works automatically and closes during the vehicle running	100%
		Convenience		
3	Shelters and its support facility	Lighting	Minimum 100 lux	100%
		Air circulation facility	1 unit	100%
		Cleaning officer	1 people	100%
		Number of people per floor area	Maximum 4 people per m ² (peak hour) Maximum 2 people per m ² (non-peak hour)	90%
	Bus fleet	Facility for passenger alight	The difference height between shelter floor and fleet floor is 10 cm in maximum	95%
		Lighting	100%	100%
		Load factor	Maximum 100%	80%
		Air temperature control	Maximum 25° C	95%

No	Type of Basic Services	Details	Minimum Standard	Achievement Report
Affordability				
4	Availability of transport integration	There is a minimum 1 route for continuing journey	95%	95%
Equity				
5	Priority seat	Minimum 4 for single/ maxi/ articulated bus and 2 for medium bus		100%
	Wheelchair space	Minimum 1 space		100%
Regularity				
	Headway	7 minutes (peak hour) and 10 minutes (non-peak hour)		80%
	Travel speed	Maximum 50 km/hour		100%
	Stop time in shelter	60 seconds		100%
6	Service information	Available and clear		100%
	Arrival time information	Available and clear		90%
	Payment system	Available in each shelter		100%
	Travel document	Available		100%
	GPS	Available		100%

Source: SPM TransJakarta, 2019; Report of Minimum Service Standard Achievement, 2019

As mentioned earlier that currently, the operation of TransJakarta is under regulation of Jakarta Governor Regulation No. 13 Year 2019 which arrange the minimum service standards of TransJakarta services. Generally, Headway is the category with the lowest achievement score for all services. In the Regulation of the Governor of DKI Jakarta No. 13 Year 2019 concerning Amendments to the Regulation of the Governor of DKI Jakarta No. 33 Year 2017 concerning Minimum Service Standards for Transjakarta Public Transport Services, it is written that the achievement of the headway for BRT and Mikrotrans during peak hours is 5 minutes and outside peak hours is 10 minutes, while Large / Medium Buses are 10 minutes for peak hours and 20 minutes outside peak hours. The low headway achievement is due to the not yet sterile Transjakarta routes (particularly BRT) and congestion while operating. At the end point, the Company has made efforts to carry out the discharge of the Bus according to the headway. Another category is the driver's rest hours where each driver is required to rest at least 30 minutes after driving the vehicle for four hours. This is because there is no comprehensive procedure that is also carried out with the operator as an internal control system for the driver. Meanwhile, for Mikrotrans currently Transjakarta has made efforts to improve one of the categories that has a large fine for SPM, namely the availability of GPS.

4. Conclusions

Public transit can be one of alternative ways in improving urban mobility, providing transportation alternatives, and reducing environmental impacts on transport sectors, while at the same time will enhance sustainability in urban areas. According to (RPJMN, 2019), in order to create more sustainable urban transport, the government of Indonesia are commit to give a priority for the improvement and development of rapid transit system in urban areas, including further development of BRT Jakarta and its dissemination to other cities in Indonesia (Angelina et al., 2017). Despite all the achievement until end of 2019, there are some barriers in the implementation of TransJakarta in which result on the slowly progress towards sustainability goals. Technological, government policy and political, and the control of infrastructure and maintenance aspects are found to be the main barriers that impede implementation and further development of TransJakarta effectively (Angelina et al., 2017).

Despite all of the barriers on the TransJakarta development, TransJakarta commits to improve their service quality throughout years of operational. The performances were seen to be significantly improved after they became Regional Owned Enterprises (BUMD) and officially renamed as PT. Transportasi Jakarta. Since then, TransJakarta actively improved their performances through expanding routes, increasing their bus fleets, as well as increasing their service integration with other road-based transport (small and medium buses) and rail-based transport (commuter lines, MRT, and LRT). Under DKI Jakarta regulation concerning the minimum service standard, TransJakarta is also obligated to fulfill the minimum standard criteria in order to ensure their service quality. This acts perform as approaches in promoting public transportation, thus can increase the ridership level. TransJakarta annual report in 2019 showed great achievements on their performance aspects in which the achievement of SPM was reported to exceed the target achievement of 2019 by reaching 92,02%. TransJakarta even reported their highest daily passenger with number of 997.238 passengers.

5. Acknowledgements

This work was supported by the research fund of Institut Teknologi Nasional Yogyakarta 2020.

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