Chapter 3

Case Study: Preference Survey in Jakarta

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CHAPTER 3
Case Study: Preference Survey in Jakarta

Introduction

Some major cities of the Association of Southeast Asian Nations (ASEAN), except Singapore, are still facing the challenge of improving the public transport services and their modal share. In emerging ASEAN countries, public transport operators and government authorities have been facing sizeable challenges in providing public transport for commuters. They need to improve their transport infrastructure and the reliability of services, which will help boost commuter satisfaction (Accenture Research Sreejith Sreedharan, 2013).

Since the latter half of last century, Asian cities have experienced rapid economic development and urbanisation resulting in a significant increase in the mobility of people and goods that are highly dependent on automobile. Most major Asian cities have exhibited a high rate of increase in car ownership. Capital cities especially in the ASEAN countries experienced the highest increase in car ownerships (Hayashi, *et al.* 2004). Only very few examples such as Singapore—which represents a success story in urban transport policy implementation in the Asian and ASEAN contexts—have formulated the policy and objective of making public transport a choice mode by setting the target of 85 percent of commuters having completed their door-to-door journey within 60 minutes during peak hours through improved transfers and priority (GIZ, 2011).

In Asian countries, shifting towards public transport (bus, trams, and rickshaws) has been experienced since 1900 but non-motorised transports were still dominant. People started to move to individual mobility, first two wheels and then four wheels, from 1945 to 1975. From 1990 to 2005, the explosion of public demand for individual mobility has overtaken public transport. And since 2005, the re-emerging interest in public transport has been regarded as an effective policy to improve people's willingness to utilise public transport (Huizenga, *et al.*, 2006).

Whilst governments are increasingly active as regards air pollution and reducing the energy used by the transport sector, there is often a large gap between the technology available and best practice know-how, the networks necessary to build consensus, and the actual implementation of transformative change. The United Nations Environment Programme (UNEP) employs a threefold strategy to address externalities from road transport; namely, Avoid–Shift–Improve. By designing these three pillars, the UNEP strategy is ensuring: (1) reduced and avoided demand for emission-intensive transport modes whilst facilitating the increased mobility of people, goods, and information and ensuring that efficient transport is devised around smart infrastructure and mobility planning; (2) a shift from more energy-intensive and environmentally harmful modes of transport to less-polluting and more efficient modes (public transport and non-motorised transport); and (3) reduced impact on energy consumption and environment through improved, cleaner transport technology and policy solutions.[1]

This approach has been extended to support the sustainable transportation development in terms of energy efficiency by including finance in the strategy, ASIF (Avoid–Shift–Improve–Finance) (ADB, 2009). ASIF is also an effective approach in mitigating CO_2 in urban transportation (Schipper, 2009). In the case of Indonesia, the government has encouraged the modal shift as an effective strategy to satisfying each citizen's remaining transport needs using the most environment-friendly modes possible as stated in the Indonesian Climate Change Sectoral Roadmap (ICSSR) (BAPPENAS, 2010).

In Indonesia, the BAPPENAS (National Development Planning Agency) has formulated the shift programme through 'pull' measures (Travel Demand Management). The Government of Indonesia planned to strengthen the public transport improvement programme by attracting people to public transport and, hence, reducing the use of private cars. The implementation of BRT in 10 cities in Indonesia is one of the programme realizations(BAPPENAS, 2010).

[1] http://www.unep.org/Transport/About.asp

The share of the BRT, especially in Jakarta which represents urban public transport performance in Indonesia, however, still remains low (ERIA Study Team, 2010). Efforts to attract people to use the public transport (BRT) should be continually carried out. If no attempt is made to this direction, the system would not be able to compete with the high motorisation rate.

Attempts to shift from private to public transport in some cities with BRT implementation in Indonesia have not yielded significant results. BRT service is not yet a public choice mode because the BRT is still less attractive compared to private motorised vehicles. Therefore, the key making the shift towards public transport service successful is how to make BRT more attractive than private vehicles.

Among many factors to shift, travel time from origin to destination, requirement for transfer between routes, and comfort during transfer have been recognized as possible variables which influence the preference to use the BRT. However, the magnitude of those variables is not really measured in order to push forward the shift. Understanding the magnitude to shift will help decision makers set reasonable policies and their implementation instruments.

To illustrate how a reasonable policy could be addressed with certain implementation instruments, a case study in Jakarta was conducted. As a representative of Indonesian and ASEAN cities, Jakarta has been facing problems of high motorisation rate, congestion, and worsening air quality. Since the last decade, the number of commuters to Jakarta has been increasing dramatically to 1.5 times as many as that of 2002. Commuters have changed their transport mode, thus the increase in cars and motorcycles (more than 50 percent). However, the share of bus users in commuters was approximately 40 percent in 2002 and declined to approximately less than 20 percent in 2010 (Coordinating Ministry of Economic Affairs, Republic of Indonesia, 2012). To address this problem in the transport sector, the government has targeted the share of urban public transport in the Great Jakarta area to about 30 percent in 2015, 34 percent in 2020, and 36 percent in 2030.[2] These policy targets are considered ambitious and need to be

[2] Rencana Induk Transportasi Perkotaan Jabodetabek (SITRAMP), 2003.

confronted with the possible means and instruments to attract public transport.

The general objective of this chapter is therefore to confirm whether BRT service improvement could achieve the targeted modal share in the policy document. Moreover, there are two specific objectives: (1) to find the possible intervention to achieve the targeted modal share of public transport, and (2) to generate a utility function of modal shift applicable for transport modelling, which is required in predicting modal shift.

To find the answer, a hypothetical improvement of BRT services in Jakarta was offered to car users in a stated preference survey. Three implementation strategies were offered to improve the service: (1) direct service with less stops and transfers between origin and destination, (2) improved infrastructure to allow BRT priority with faster cruise speed than regular service, and (3) improved standard operating procedure (SOP) to reduce transfer time. Based on this implementation instrument, a stated preference survey was conducted with three choice sets: (1) reduced travel time, (2) reduced number of transfers, and (3) time to transfer. The survey was conducted in BRT (TransJakarta) Corridor 3 (route Kalideres – the central of Jakarta). Two groups of respondents consisted of existing BRT users and commuters who live in the Tangerang city area. Total respondents were 240, 60 of whom were existing BRT users and 180 respondents were commuters.

Material and Method

Approach for Simulation

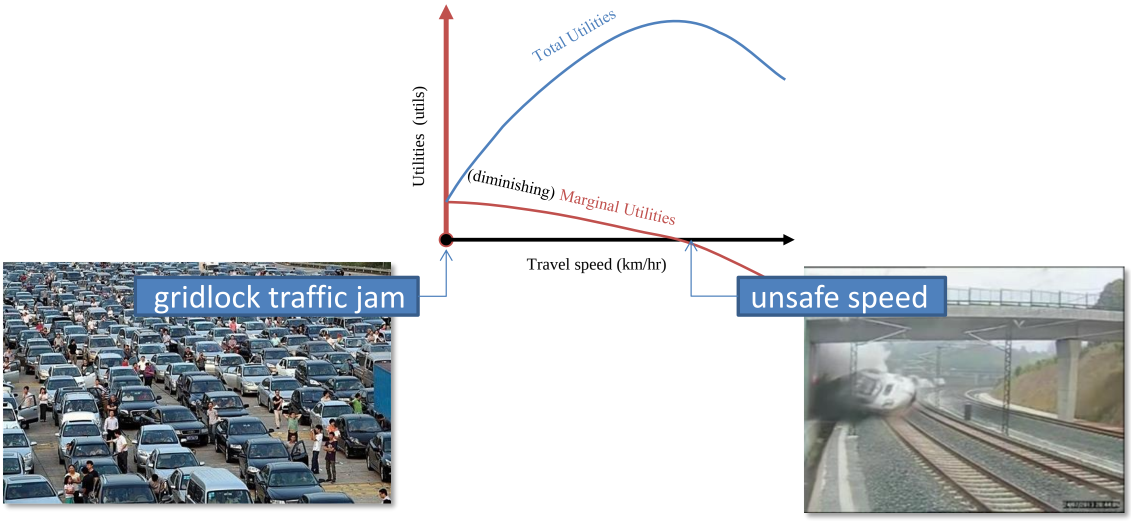
The approach used in the analysis is the Utilitarian Theory. Utility refers to usefulness, the ability of something to satisfy needs or wants. It represents satisfaction experienced by a consumer of a commodity or a good. Utility rate can be measured through:

- Marginal utility – changes of satisfaction gained from an additional unit increase or loss from a decrease in the consumption of that good or service. Marginal utility will diminish at the higher existing level of service as illustrated in Figure 3-1.

- Total utility – the sum of all the marginal utilities of the individual units.

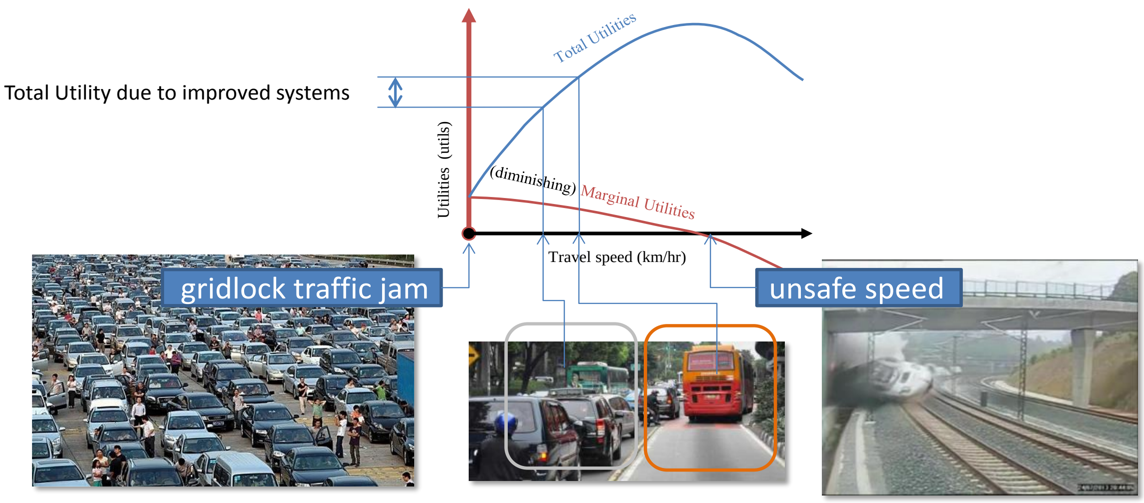
The utilitarian approach is highly relevant to the study. BRT improvement aims to increase the total utility of the commuters and, therefore, attract car users to use the BRT. This study will measure the preference to shift to the BRT due to the additional happiness (marginal utility) as the impact of increasing one unit of level of service (e.g., km/hr travel speed).

Figure 3-1: Marginal Utility Concept on BRT Service



Total utility (satisfaction) resulting in improved systems determines a preference to shift as shown in Figure 3-2:

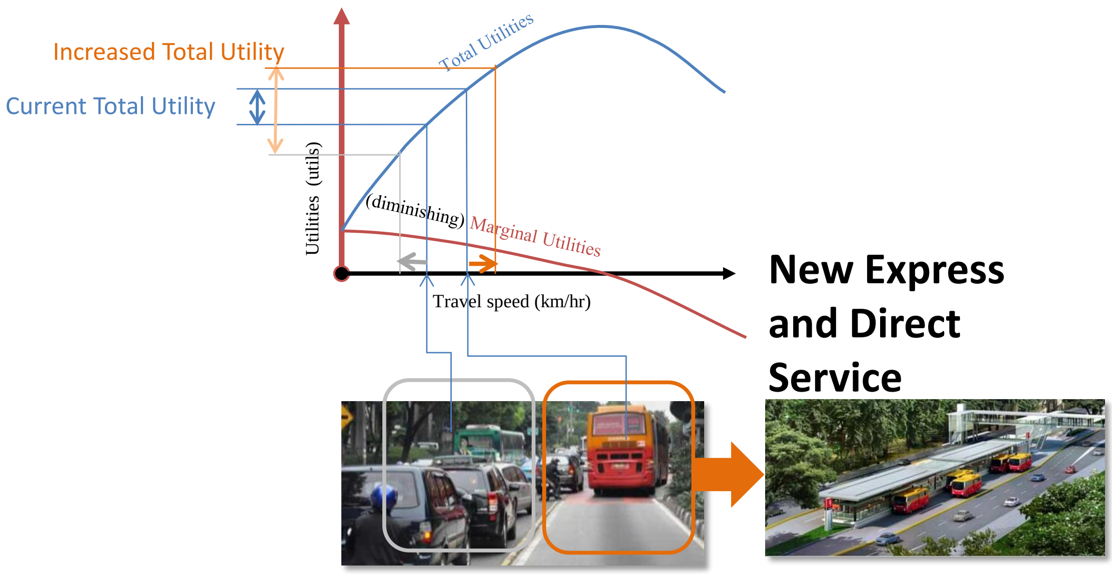
Figure 3-2: Total Utility and Preference to Shift



Increasing utility to promote modal shift can be carried out by increasing the speed of the new system and reducing the speed of private vehicles.

Modal shift from private cars to public transport is very urgent for reducing energy consumption in the transport sector especially in big cities such as the Jakarta metropolitan area. Those two options could be applied to encourage commuters to shift to BRT public transport. However, in this research, we only focus on increasing the speed of the new system by introducing express and direct service. This concept is shown in the Figure 3-3.

Figure 3-3: Increasing Utility to Promote Modal Shift



Research Design

Variables

The stated preference studies aimed to assess how respondents' choices vary in different hypothetical situations. Stated preference is a survey technique concerned with measuring and understanding the preferences underlying people's stated choices based on how they respond to the scenario. In the questionnaire, respondents were presented with choices of each scenario about what modal shift resulted from introducing express BRT at the current fare with some independent variables as follows:

1) reduced travel time,
2) minimize number of transfer, and
3) minimize transfer time.

Intervention to improve the service

To improve this hypothetical performance, a set of possible interventions for express service is proposed as follows:

1)direct route from origin to destination,
2)improved SOPs/information systems to reduce transfer time, and
3)improved infrastructure.

For each intervention, several scenarios are explained as below.

1) Direct route from origin to destination, options

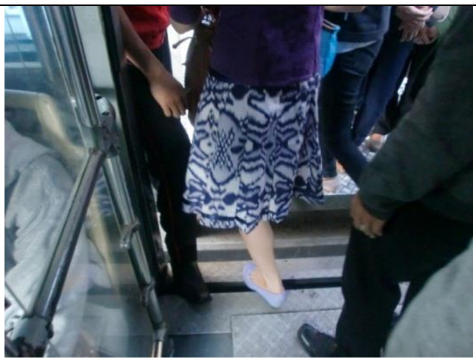
a) No transfer (transfer time = 0)

Figure 3-4: No Transfer Scenario

	This scenario describes a direct route from origin to destination (the bus stops only at the shelter of origin and last destination). It means the passengers will not have to transfer during their trip. As illustrated in the picture, the bus, which is full of passengers, does not stop at each shelter.

b) One transfer (with improved transfer time)

Figure 3-5: One Transfer Scenario (with improved transfer time)

	The passengers will transfer only once during their trip. They need to transfer at a shelter during their trip with improved transfer time.

2) Improved SOPs/information systems to reduce transfer time

   a) Current procedure (15 minutes' transfer time)

Figure 3-6: 15 Minutes' Transfer Time

	Currently, passengers need 15 minutes to transfer at the shelter. As shown in Figure 3-6, there is a long queue at the shelter whilst passengers wait for the bus.

   b) Minimum SOP improvement (10 minutes)

Figure 3-7: 10 Minutes' Transfer Time

	This is to improve the SOP at the shelter, such as decreasing headway of the bus. As the result, the queue is shorter whilst passengers await the bus.

   c) Maximum SOP improvement (five minutes)

Figure 3-8: Five Minutes' Transfer Time

	This scenario depicts a reduced transfer time of five minutes. The procedure consists of a maximum SOP improvement, such as the very close bus headway. Through this design, the passenger queue will be shorter than before.

3) Improved infrastructure

   a) Existing infrastructure (at current travel time)

Figure 3-9: Existing Infrastructure

	As shown in the figure, the TransJakarta bus is still obstructed by other vehicles that pass through the bus way. Therefore, maximum travel speed cannot be reached because of the traffic jam. This situation lessens the willingness of private car users to use the BRT since travel time is the same.

   b) Improved infrastructure (reduced travel time)

The most important way to reduce travel time is by improving the infrastructure through the following:

- Sterile dedicated lane

Figure 3-10: Sterile Dedicated Lane

	Sterilisation of the bus way makes TransJakarta travel time faster than that of private vehicles. As shown on Figure 3-10, car users will greatly desire to move to the TransJakarta lane.

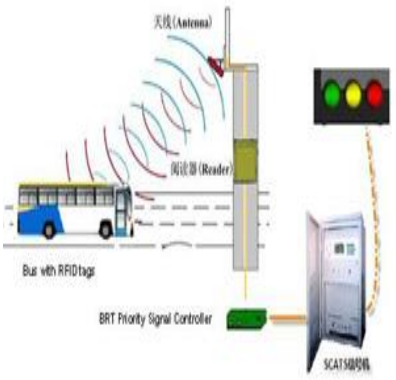
- Passing place

Figure 3-11: Passing Place

	This scenario needs wide spaces for implementation. This solution can enable the express bus to pass the regular bus so its travel time would be faster than that of the regular. Seizing the car user space can function as a ‘push factor’ to make people move to use TransJakarta.

- Bus priority signal

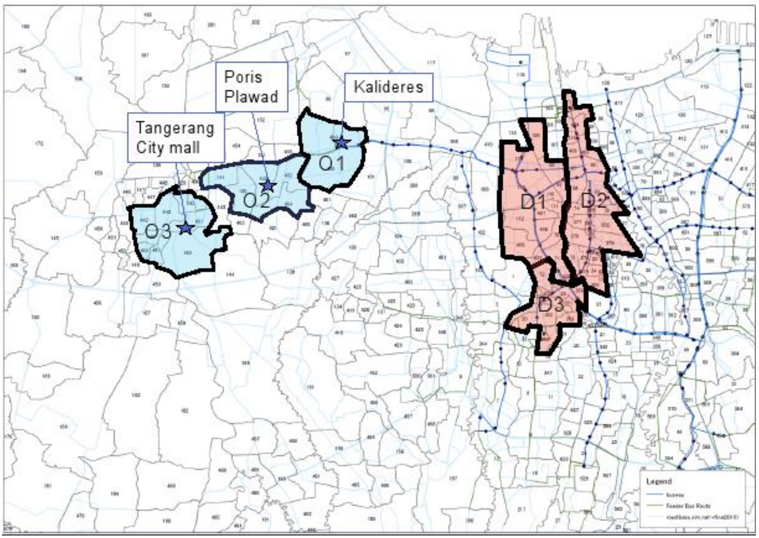
Figure 3-12: Bus Priority Signal

	Using intelligent transport systems can be a solution to improve the infrastructure. Based on the signal emitted by TransJakarta, the detector will automatically change the traffic light to green so that there are no stops for TransJakarta at intersections.

Corridor, Origin, and Destination

This survey was conducted at Corridor 3 as a sample for all corridors of TransJakarta. Therefore, targeted private car commuters for this survey were restricted based on the origin–destination so that it is possible to shift using BRT Corridor 3 as shown by Figure 3-13.

Figure 3-13: Origin–Destination Zone



The origin zone consists of three areas around Tangerang City Mall, Poris Plawad bus station, and Kalideres shelter. However, the destination zone consists of three zones around the city centre of Jakarta (D1, D2, and D3).

Method for data collection

To recognize the survey location, the respondent reaction, and to evaluate the survey method, a pilot survey was conducted three days before the final survey. It was conducted in one day by the surveyors to determine the best way to catch the respondents in each location. Moreover, a souvenir was given to attract respondents. The pilot survey revealed that the questionnaire design was capable of retrieving the required information on passenger willingness to shift from private cars to the BRT and obtain advice for the improvement of TransJakarta from its existing condition.

This survey targets two groups: BRT users who were expected to inform about improvement in services of TransJakarta at Corridor 3 and non-BRT users/private car commuters from Tangerang (the most possible shifting target to use Corridor 3) who were expected to reveal their willingness to shift to the BRT from eight choice sets of stated preference questionnaire.

The BRT user survey consisted of 50 (with 10 additional reserved) respondents who were found during morning rush hours (5:00–7:00 am) at

Kalideres shelter. It was conducted by four surveyors on February 25, 2014. On the other hand, the commuter survey consisted of 150 (with 30 additional reserved) respondents found at destination areas of commuters, such as office parking lots from mornings until afternoons and mall parking lots from afternoons to evenings. It was conducted by 10 surveyors on February 25–26, 2014. Commuter respondents were identified by their car IDs from the area of origin (Tangerang).

Valid answered forms should meet the validation criteria as follows:

1. Car ID – this is a MUST to be put on the form to screen the area of origin.
2. The number of forms reaches the target (50 for BRT users, 150 for commuters).
3. All the questions were answered completely

Structure of the questionnaire

The questionnaire consists of the respondent's profile, stated preference, and open questions.

1. Respondent's profile

To ensure that the survey was representative of the desired target audience, demographic and socioeconomic characteristics were collected from each respondent. Characteristics collected or respondent's profile included in the first part of the questionnaire consists of the following:

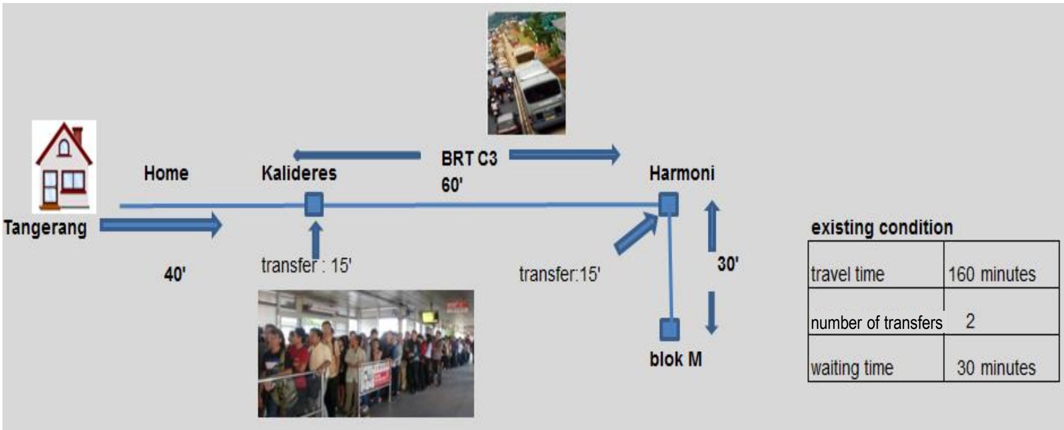
a) origin
b) destination
c) travel purpose
d) gender
e) age
f) job
g) education
h) the vehicle used for daily trips? Reason?
i) travel patterns in detail (each departure – time and location; each arrival – time and location, distance, mode, and transfer time)
j) income/month

k) household expenditure
l) transportation expenditure
m) When the respondent can use TransJakarta, what vehicle was needed before (i.e., to connect from origin to first shelter)?
n) When the respondent can use TransJakarta, what vehicle was needed after (i.e., to connect from shelter to last destination)?

2. Stated preference questions

The stated preference questionnaire is dedicated only for commuters or non-BRT users. Respondents were shown cards of various scenarios, then asked to decide whether they will shift to the BRT.
Before answering the stated preference questions, respondents were updated on the existing condition of TransJakarta (see Figure 3-14).

Figure 3-14: Existing Condition of TransJakarta Corridor 3



A detailed explanation of the existing condition of TransJakarata Corridor 3 is as follows:

a) The average travel time from home (at Tangerang) to the first shelter of TransJakarta (Kalideres) at Corridor 3 is 40 minutes

Figure 3-15: 15 Minutes' Transfer Time

	At Kalideres shelter, 15 minutes is the maximum transfer time (for ticket queuing and waiting for the bus).

Figure 3-16: Existing Travel Time = 60 Minutes

	Currently, the average travel time using TransJakarta from Kalideres shelter through Harmoni shelter is 60 minutes. A lot of private cars using the dedicated bus way prevent TransJakarta to run at maximum speed, hence, affecting travel time.

b) If the passenger needs to continue the trip through Blok M shelter, he or she has to transfer at Harmoni shelter and queue for 15 minutes for the ticket and the bus.

c) The average travel time using TransJakarta from Harmoni shelter to Blok M shelter is 30 minutes.

Figure 3-17 presents an example of stated preference choice for respondents. Full questionnaires are available in the appendixes.

Figure 3-17: Example of Stated Preference Questionnaire

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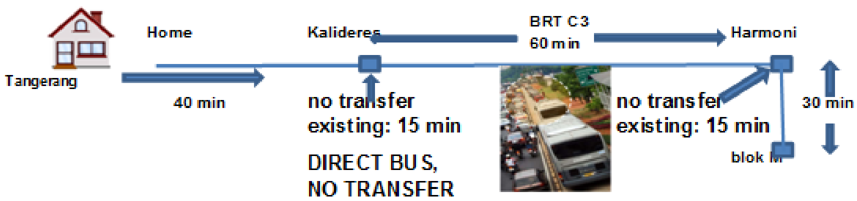
Reduced travel time (minutes)	30
Number of Shelter transfers	0
Transfer time (minutes)	0
By services above, what will you do	………

☐ Certainly Ride ☐ Probably Ride ☐ Doubtful ☐ Probably not ride ☐ Certainly Not Ride



Open question

The last part of this questionnaire is on the existing condition of TransJakarta. The respondents were asked what services of TransJakarta should be improved and why.

Utility Function Formulation Method

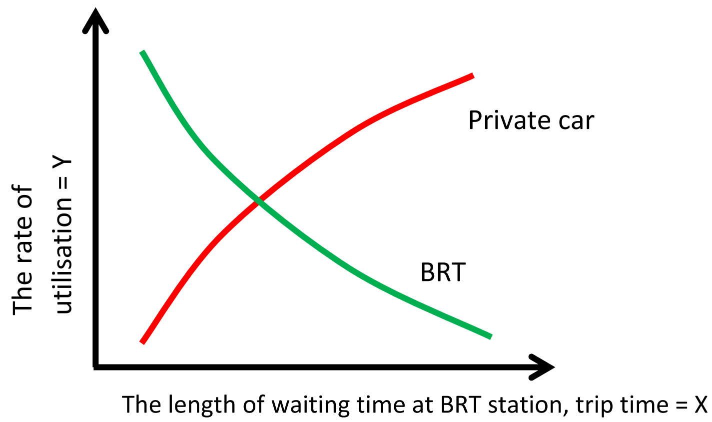
To explain the behaviour of respondents in choosing the transport mode, a statistical analysis with logit models was conducted. The model form is as follows:

$$\begin{aligned}\Pr[Y_j = 1 | X_{1j}, \ldots X_{k,j}] &= \frac{1}{1 + \exp\left(-\beta_1^0 X_{1j} - \ldots - \beta_k^0 X_{kj}\right)} \\ &= \frac{1}{1 + \exp\left(-\sum_{i=1}^{k} \beta_i^0 X_{ij}\right)},\end{aligned}$$

Where:
Pr = chance the respondent will shift
Y = respondent's answer, where 1 means certainly shifting, 0 means certainly not shifting
X = factor affected

Graphically, the model is presented in Figure 3-18.

Figure 3-18: Logit Model Illustration



Based on the model, one will know how private car users will respond to several variable sets, including a reduction in travel time, waiting time at the bus stop, and number of transfers.

Moreover, to confirm whether BRT service improvement could achieve the targeted modal share in the policy document, a comparison to government target share of urban public transport in the Greater Jakarta area, which is approximately 30 percent in 2015,[3] was performed. With current public transport share of 16.7 percent and cars 17.4 percent[4], the target of 30 percent share suggests 76 percent of car users shifting. The above utility function then is used to find the possible intervention to achieve the targeted modal share of public transport.

Result

Preference description

Priority for improvement

For each type of questionnaire, respondents were asked about the priority for TransJakarta improvement based on their desire. The following is the hierarchy of priorities—with number one as the highest—as requested by respondents: (1) improvements in bus facilities; (2) improvement of SOPs, schedule, and driver's ability; and (3) improvement of safety facilities. All these priority improvements could potentially attract people to use TransJakarta. Detailed results are illustrated in Figure 3-19.

[3] Rencana Induk Transportasi Perkotaan Jabodetabek (SITRAMP), 2003.
[4] JUTPI, 2010.

Figure 3-19: First Priority for Improvement

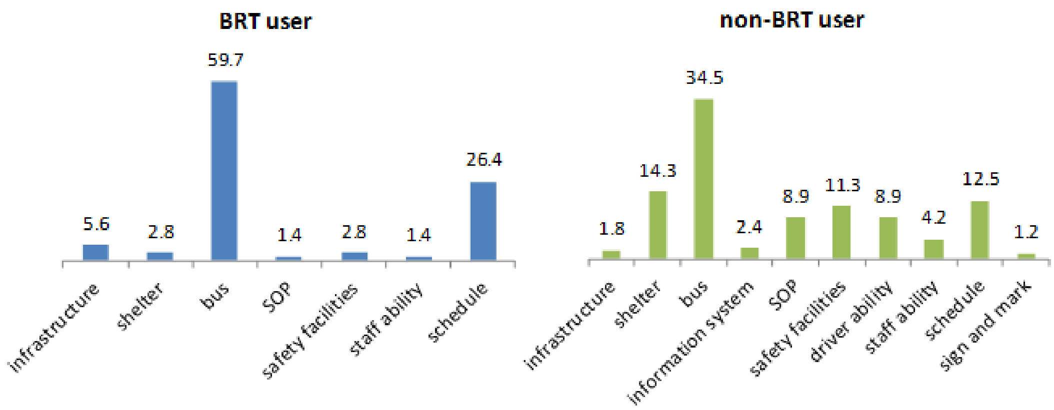
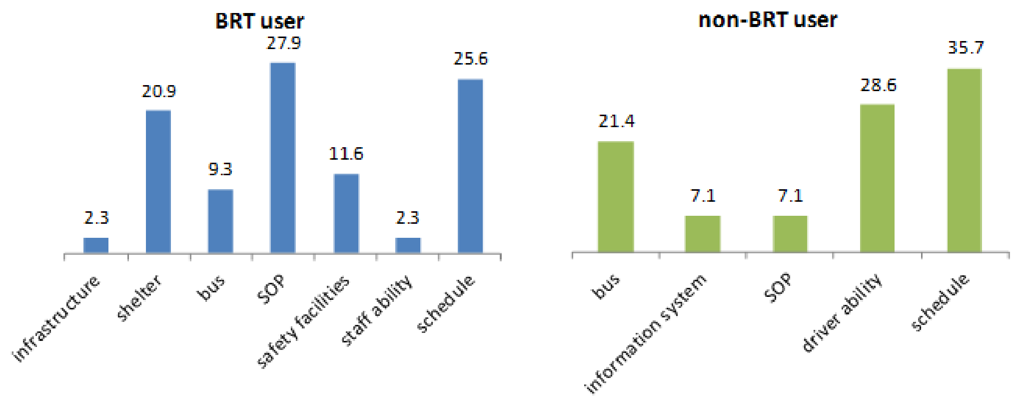
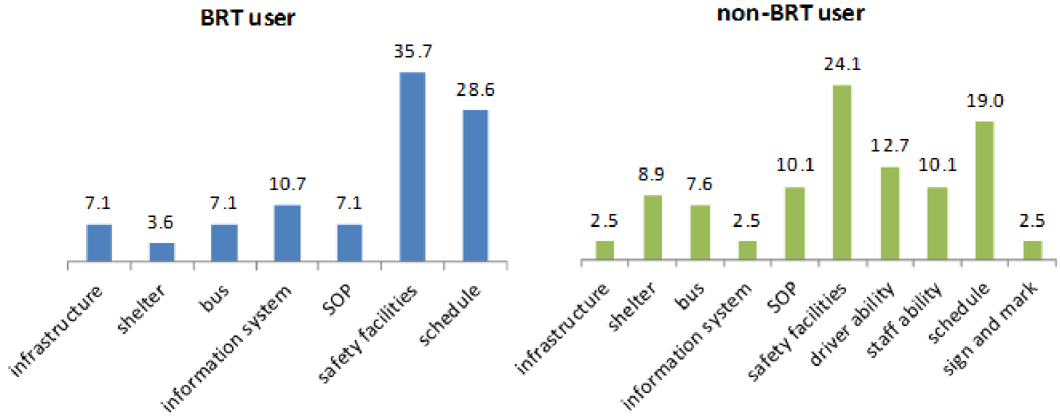


Figure 3-20: Second Priority for Improvement



Note :SOP = standard operating procedure.

Figure 3-21: Third Priority for Improvement

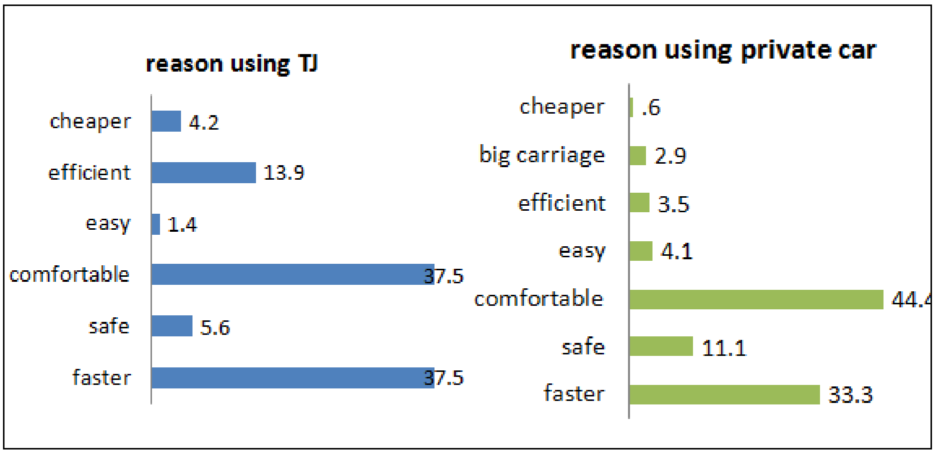


Note :SOP = standard operating procedure.

Reasons for using TransJakarta or private cars

The major reasons BRT users and private car users prefer their particular mode of transport are basically the same. As can be seen from Figure 3-22, BRT users said that they like to use TransJakarta since it is comfortable and can take them faster to their destination. Private car users said that their cars were more comfortable and faster to use than other modes.

Figure 3-22: Reasons for Using TransJakarta or Private Car

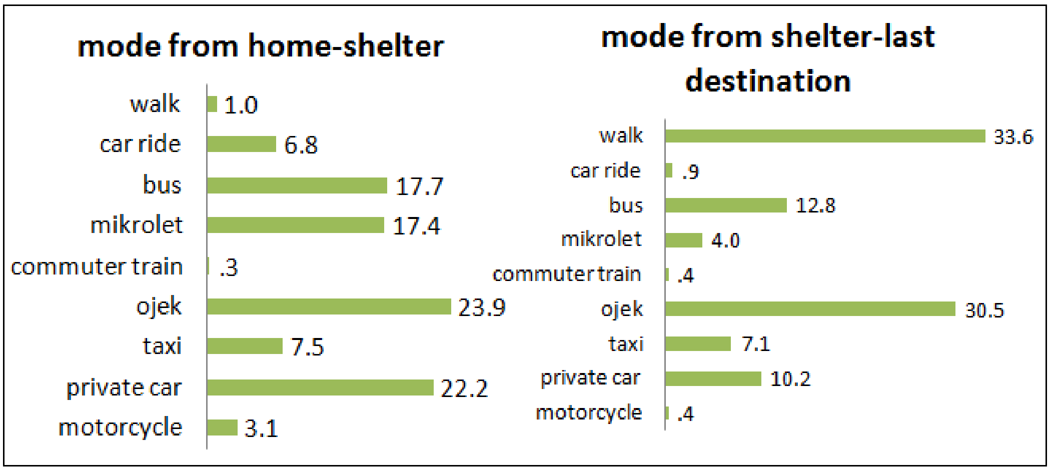


Note :TJ = TransJakarta.

Non-user: If I can use TransJakarta

Before starting the stated preference questions, private car users were asked what complementary transport mode they need if they can use TransJakarta as their daily transport. The top four choices were *ojek* (motorcycle taxi), private car, and bus or *mikrolet* (minibus); they said these can take them from home to the closest TransJakarta shelter. On the other end, they prefer to walk or use *ojek* to bring them from the shelter to the last destination.

Figure 3-23: Mode Needed from Home to Shelter and from Shelter to Last Destination



Other survey results on respondent characteristics are found in the appendix.

Utility function

The model was formulated for three scenarios—namely, the pessimistic scenario, the moderate, and the optimistic. Each scenario has the following assumptions:

- Pessimistic scenario – respondents who answered 'doubtful' would not switch to the BRT
- Moderate scenario – respondents who answered 'doubtful' were omitted in the calculation
- Optimistic scenario – respondents who answered 'doubtful' would switch to the BRT

Calculations were performed using the SPSS software, with the results of calculations for each scenario presented as follows:
Pessimistic scenario: doubtful~not shifting

Logit model calculation for the pessimistic scenario shows the following results:

Table 3-1: Logit Model Result – Pessimistic Scenario

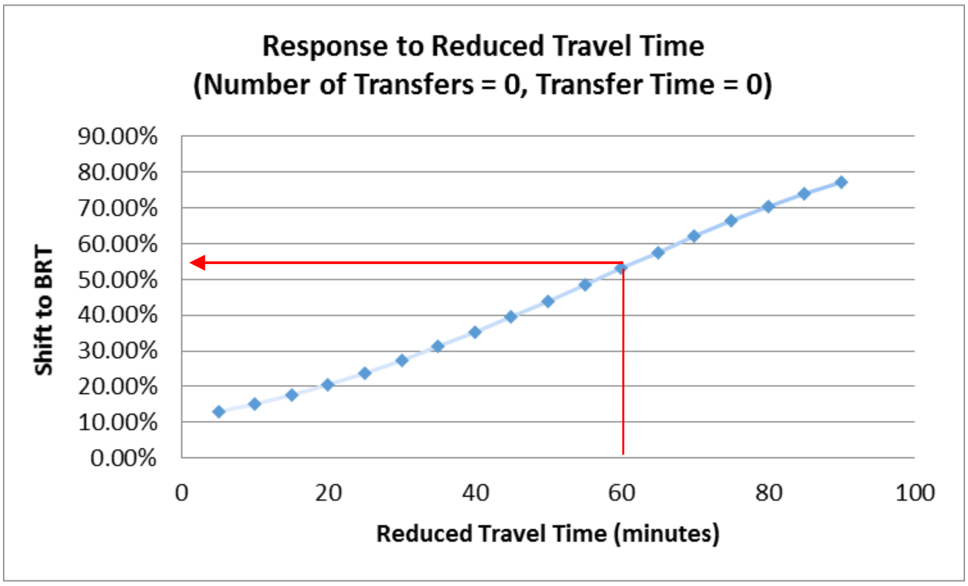
Variables in the Equation							
		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1[a]	RTT	.037	.004	90.253	1	.000	1.037
	NoT	-1.087	.257	17.834	1	.000	.337
	TT	-.052	.026	4.119	1	.042	.949
	Constant	-2.083	.227	84.468	1	.000	.125

Note :RTT = reduced travel time, NoT = number of transfers, TT = transfer time.

The result shows all the variables with a significance level of below one percent (variables NoT and RTT), and below five percent (variable TT).

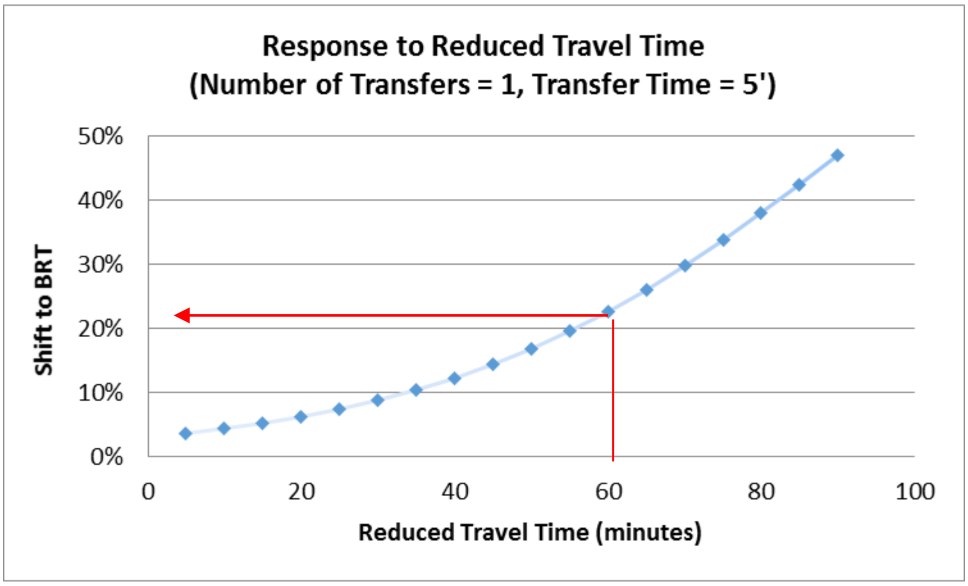
Graphically, the modelling results for variations of a reduction in travel time are presented in Figure 3-24.

Figure 3-24: Response to Reduced Travel Time – Pessimistic Scenario



To see the impact of other variables, such as the number of transfers and the transfer time, the level of response to reduction in travel time can be calculated with a variation of different values on the two variables (see Figure 3-25).

Figure 3-25: Response to Reduced Travel Time – Pessimistic Scenario (Sensitivity Analysis)



The figure shows the respondents' sensitivity to changes in the number of transfers and transfer time. The changes led to a decrease in the willingness to shift from about 50 percent to about 20 percent in decreased travel time by one hour.

Moderate: doubtful~omitted

Calculation results of the logit model for moderate scenario are shown in Table 3-2.

Table 3-2: Logit Model Result – Moderate Scenario

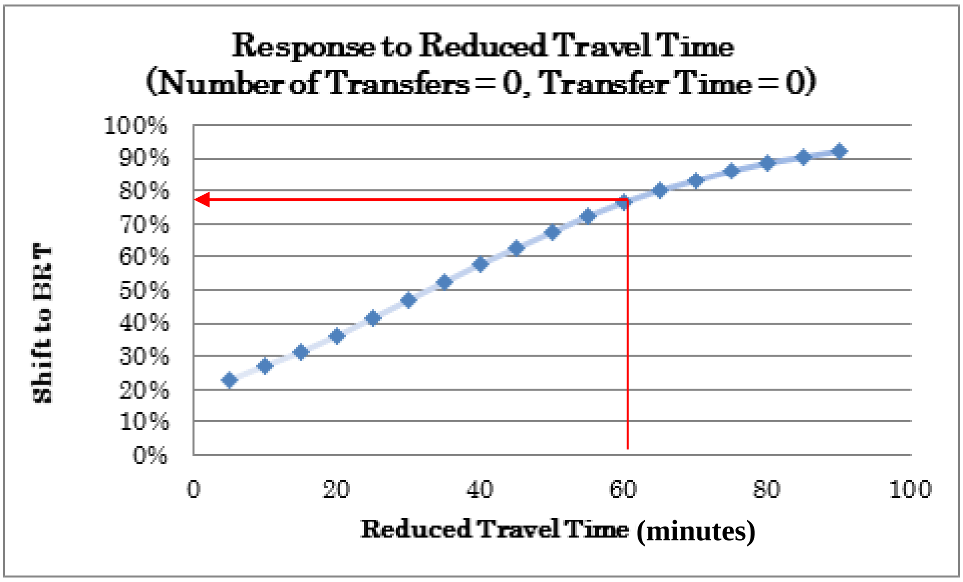
Variables in the Equation							
		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1[a]	RTT	.043	.005	91.799	1	.000	1.044
	NoT	-1.642	.278	34.868	1	.000	.194
	TT	-.036	.027	1.817	1	.178	.964
	Constant	-1.427	.257	30.699	1	.000	.240

Note :RTT = reduced travel time, NoT = number of transfers, TT = transfer time.

The results show that the variables RTT and NoT are significant, with a value of below one percent. Whilst the TT variable is not significant at the five percent level, it was still used in the model because of its influence to meet the assumption of theory (additions of TT will reduce the willingness to shift).

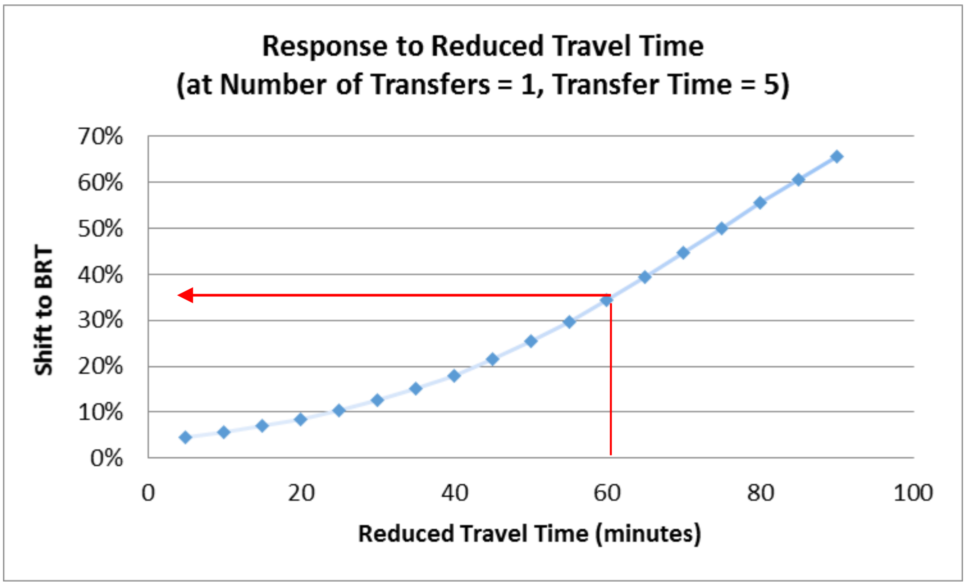
Graphically, with variations in reduced travel time, various scenarios of time travel and other variables assumed to be zero, the result is as follows:

Figure 3-26: Response to Reduced Travel Time – Moderate Scenario



When the number of transfers is one and transfer time is five minutes, the results are illustrated as follows:

Figure 3-27: Response to Reduced Travel Time – Moderate Scenario (Sensitivity Analysis)



These results indicate a decrease of willingness to shifting from about 75 percent to about 30 percent.

Optimistic: doubtful~shifting

The calculation results of the logit model for the optimistic scenario are shown in Table 3-3.

Table 3-3: Logit Model Result – Optimistic Scenario

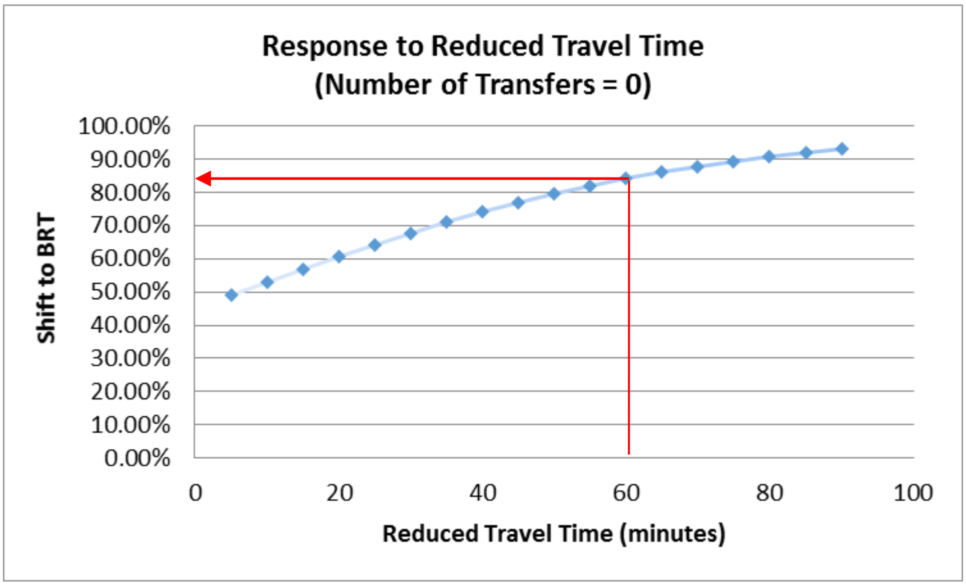
		B	S.E.	Wald	df	Sig.	Exp(B)
Step 2[b]	RTT	,031	,003	102,952	1	,000	1,031
	NoT	-1,273	,114	123,976	1	,000	,280
	Constant	-,187	,177	1,108	1	,292	,830

Note : RTT = reduced travel time, NoT = number of transfers, TT = transfer time.

The results show variables RTT and NoT are significant to use in the model, with a level of below one percent, while the variable TT is not significant and the effect is contrary to the assumption of the theory, hence, it is removed from the model.

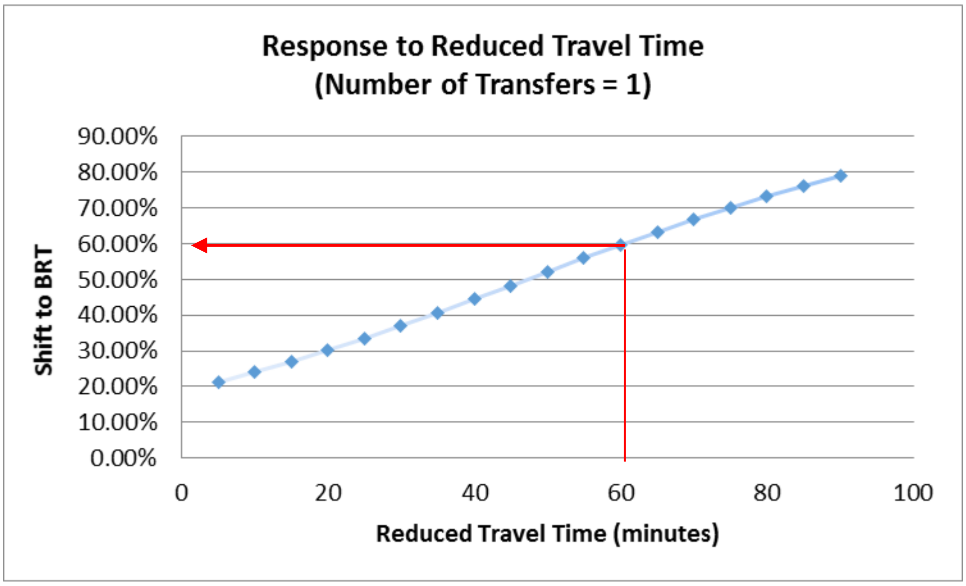
Graphically, with various scenarios of time travel and other variables zero, the result is as follows:

Figure 3-28: Response to Reduced Travel Time – Optimistic Scenario



If the number of transfers = 1, the result is shown on Figure 3-29.

Figure 3-29: Response to Reduced Travel Time – Optimistic Scenario (Sensitivity Analysis)

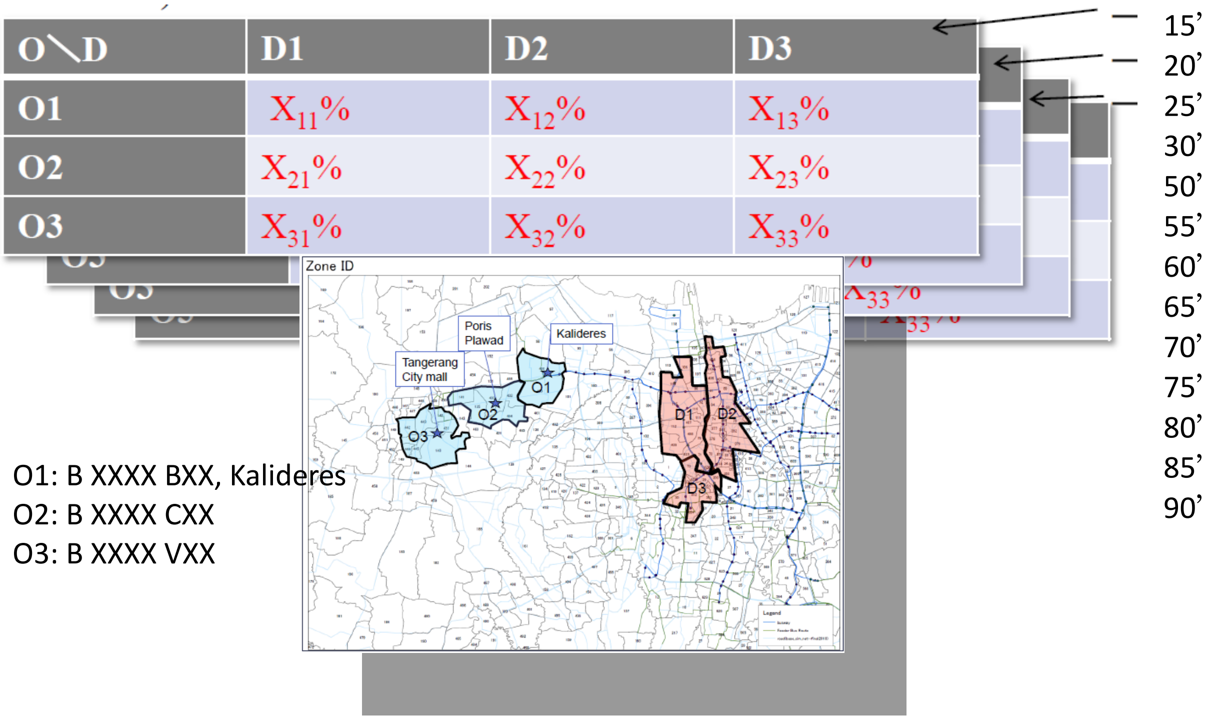


These results indicate a decrease of willingness to shift from about 80 percent to about 60 percent.

Ratio of car users shifting to BRT

The model presented earlier is a general model applicable to all conditions. In fact, there are different characteristics in different origin destinations due to the different routes, important variables, and different treatment needs (see Figure 3-30). These different characteristics are calculated as weight in general formula, so each origin destination will have a different amount of shifting with general condition.

Figure 3-30: Logit Model Result Summary Illustration



The results of shifting calculation for different characteristics on several scenarios are presented in Tables 3-5 to 3-7. The cells in green indicate the achieved policy target of 76 percent public transport shifting.

Table 3-4: Logit Model Result Sheet – Pessimistic Scenario

1	SYSTEMS TIME REDUCTION:	15		NoT:	1	TT:	15		
	OD Time Reduction	D1	D2	D3		Car to BRT Shift	D1	D2	D3
	O1	0.0	15.0	15.0		O1	1.89%	3.24%	3.24%
	O2	0.0	15.0	15.0		O2	1.89%	3.24%	3.24%
	O3	0.0	15.0	15.0		O3	1.89%	3.24%	3.24%
2	SYSTEMS TIME REDUCTION:	20		NoT	1	TT:	10		
	OD Time Reduction	D1	D2	D3		Car to BRT Shift	D1	D2	D3
	O1	5.0	20.0	20.0		O1	2.92%	4.96%	4.96%
	O2	5.0	20.0	20.0		O2	2.92%	4.96%	4.96%
	O3	5.0	20.0	20.0		O3	2.92%	4.96%	4.96%
3	SYSTEMS TIME REDUCTION:	25		NoT:	1	TT:	5		
	OD Time Reduction	D1	D2	D3		Car to BRT Shift	D1	D2	D3
	O1	10.0	25.0	25.0		O1	4.48%	7.52%	7.52%
	O2	10.0	25.0	25.0		O2	4.48%	7.52%	7.52%
	O3	10.0	25.0	25.0		O3	4.48%	7.52%	7.52%
4	SYSTEMS TIME REDUCTION:	30		NoT:	0	TT:	0		
	OD Time Reduction	D1	D2	D3		Car to BRT Shift	D1	D2	D3
	O1	0.0	30.0	30.0		O1	11.08%	27.31%	27.31%
	O2	0.0	30.0	30.0		O2	11.08%	27.31%	27.31%
	O3	0.0	30.0	30.0		O3	11.08%	27.31%	27.31%
5	SYSTEMS TIME REDUCTION:	50		NoT:	1	TT:	15		
	OD Time Reduction	D1	D2	D3		Car to BRT Shift	D1	D2	D3
	O1	33.6	76.3	40.1		O1	6.23%	24.22%	7.78%
	O2	75.5	79.3	50.6		O2	23.68%	26.34%	11.05%
	O3	80.7	77.9	50.0		O3	27.36%	25.36%	10.84%
6	SYSTEMS TIME REDUCTION:	55		NoT:	1	TT:	10		
	OD Time Reduction	D1	D2	D3		Car to BRT Shift	D1	D2	D3
	O1	38.6	81.3	45.1		O1	9.38%	33.23%	11.62%
	O2	80.5	84.3	55.6		O2	32.58%	35.77%	16.21%
	O3	85.7	82.9	55.0		O3	36.98%	34.60%	15.92%
7	SYSTEMS TIME REDUCTION:	60		NoT:	1	TT:	5		
	Real	D1	D2	D3		Car to BRT Shift	D1	D2	D3
	O1	43.6	86.3	50.1		O1	13.89%	43.67%	17.00%
	O2	85.5	89.3	60.6		O2	42.95%	46.45%	23.16%
	O3	90.7	87.9	60.0		O3	47.75%	45.18%	22.78%
8	SYSTEMS TIME REDUCTION:	65		NoT:	0	TT:	0		
	Real	D1	D2	D3		Car to BRT Shift	D1	D2	D3
	O1	33.6	91.3	55.1		O1	30.02%	78.17%	48.60%
	O2	75.5	94.3	65.6		O2	66.68%	80.02%	58.18%
	O3	80.7	92.9	65.0		O3	70.85%	79.19%	57.66%

Table 3-5: Logit Model Result Sheet – Moderate Scenario

1	SYSTEMS TIME REDUCTION:	15		NoT:	1	TT:	15		
	OD Time Reduction	D1	D2	D3		Car to BRT	D1	D2	D3
	O1	0.0	15.0	15.0		O1	2.63%	4.92%	4.92%
	O2	0.0	15.0	15.0		O2	2.63%	4.92%	4.92%
	O3	0.0	15.0	15.0		O3	2.63%	4.92%	4.92%
2	SYSTEMS TIME REDUCTION:	20		NoT	1	TT:	10		
	OD Time Reduction	D1	D2	D3		Car to BRT	D1	D2	D3
	O1	5.0	20.0	20.0		O1	3.86%	7.15%	7.15%
	O2	5.0	20.0	20.0		O2	3.86%	7.15%	7.15%
	O3	5.0	20.0	20.0		O3	3.86%	7.15%	7.15%
3	SYSTEMS TIME REDUCTION:	25		NoT:	1	TT:	5		
	OD Time Reduction	D1	D2	D3		Car to BRT	D1	D2	D3
	O1	10.0	25.0	25.0		O1	5.65%	10.29%	10.29%
	O2	10.0	25.0	25.0		O2	5.65%	10.29%	10.29%
	O3	10.0	25.0	25.0		O3	5.65%	10.29%	10.29%
4	SYSTEMS TIME REDUCTION:	30		NoT:	0	TT:	0		
	OD Time Reduction	D1	D2	D3		Car to BRT	D1	D2	D3
	O1	0.0	30.0	30.0		O1	19.36%	46.86%	46.86%
	O2	0.0	30.0	30.0		O2	19.36%	46.86%	46.86%
	O3	0.0	30.0	30.0		O3	19.36%	46.86%	46.86%
5	SYSTEMS TIME REDUCTION:	50		NoT:	1	TT:	15		
	OD Time Reduction	D1	D2	D3		Car to BRT	D1	D2	D3
	O1	33.6	76.3	40.1		O1	10.39%	42.45%	13.31%
	O2	75.5	79.3	50.6		O2	41.60%	45.71%	19.50%
	O3	80.7	77.9	50.0		O3	47.24%	44.22%	19.10%
6	SYSTEMS TIME REDUCTION:	55		NoT:	1	TT:	10		
	OD Time Reduction	D1	D2	D3		Car to BRT	D1	D2	D3
	O1	38.6	81.3	45.1		O1	14.72%	52.34%	18.61%
	O2	80.5	84.3	55.6		O2	51.47%	55.63%	26.50%
	O3	85.7	82.9	55.0		O3	57.14%	54.13%	26.01%
7	SYSTEMS TIME REDUCTION:	60		NoT:	1	TT:	5		
	OD Time Reduction	D1	D2	D3		Car to BRT	D1	D2	D3
	O1	43.6	86.3	50.1		O1	20.44%	62.04%	25.39%
	O2	85.5	89.3	60.6		O2	61.22%	65.11%	34.92%
	O3	90.7	87.9	60.0		O3	66.49%	63.73%	34.35%
8	SYSTEMS TIME REDUCTION:	65		NoT:	0	TT:	0		
	OD Time Reduction	D1	D2	D3		Car to BRT	D1	D2	D3
	O1	33.6	91.3	55.1		O1	50.76%	92.63%	72.35%
	O2	75.5	94.3	65.6		O2	86.36%	93.48%	80.49%
	O3	80.7	92.9	65.0		O3	88.84%	93.11%	80.09%

Table 3-6: Logit Model Result Sheet – Optimistic Scenario

1	SYSTEMS TIME REDUCTION:	15		NoT:	1	TT:	15		
	OD Time Reduction	D1	D2	D3		Car to BRT	D1	D2	D3
	O1	0.0	15.0	15.0		O1	18.85%	26.96%	26.96%
	O2	0.0	15.0	15.0		O2	18.85%	26.96%	26.96%
	O3	0.0	15.0	15.0		O3	18.85%	26.96%	26.96%
2	SYSTEMS TIME REDUCTION:	20		NoT	1	TT:	10		
	OD Time Reduction	D1	D2	D3		Car to BRT	D1	D2	D3
	O1	5.0	20.0	20.0		O1	21.32%	30.10%	30.10%
	O2	5.0	20.0	20.0		O2	21.32%	30.10%	30.10%
	O3	5.0	20.0	20.0		O3	21.32%	30.10%	30.10%
3	SYSTEMS TIME REDUCTION:	25		NoT:	1	TT:	5		
	OD Time Reduction	D1	D2	D3		Car to BRT	D1	D2	D3
	O1	10.0	25.0	25.0		O1	24.03%	33.44%	33.44%
	O2	10.0	25.0	25.0		O2	24.03%	33.44%	33.44%
	O3	10.0	25.0	25.0		O3	24.03%	33.44%	33.44%
4	SYSTEMS TIME REDUCTION:	30		NoT:	0	TT:	0		
	OD Time Reduction	D1	D2	D3		Car to BRT	D1	D2	D3
	O1	0.0	30.0	30.0		O1	45.34%	67.68%	67.68%
	O2	0.0	30.0	30.0		O2	45.34%	67.68%	67.68%
	O3	0.0	30.0	30.0		O3	45.34%	67.68%	67.68%
5	SYSTEMS TIME REDUCTION:	50		NoT:	1	TT:	15		
	OD Time Reduction	D1	D2	D3		Car to BRT	D1	D2	D3
	O1	33.6	76.3	40.1		O1	39.59%	70.98%	44.45%
	O2	75.5	79.3	50.6		O2	70.46%	72.88%	52.53%
	O3	80.7	77.9	50.0		O3	73.73%	72.02%	52.08%
6	SYSTEMS TIME REDUCTION:	55		NoT:	1	TT:	10		
	OD Time Reduction	D1	D2	D3		Car to BRT	D1	D2	D3
	O1	38.6	81.3	45.1		O1	43.33%	74.05%	48.29%
	O2	80.5	84.3	55.6		O2	73.57%	75.82%	56.36%
	O3	85.7	82.9	55.0		O3	76.61%	75.02%	55.92%
7	SYSTEMS TIME REDUCTION:	60		NoT:	1	TT:	5		
	OD Time Reduction	D1	D2	D3		Car to BRT	D1	D2	D3
	O1	43.6	86.3	50.1		O1	47.15%	76.90%	52.15%
	O2	85.5	89.3	60.6		O2	76.46%	78.53%	60.11%
	O3	90.7	87.9	60.0		O3	79.26%	77.80%	59.68%
8	SYSTEMS TIME REDUCTION:	65		NoT:	0	TT:	0		
	OD Time Reduction	D1	D2	D3		Car to BRT	D1	D2	D3
	O1	33.6	91.3	55.1		O1	70.06%	93.28%	81.95%
	O2	75.5	94.3	65.6		O2	89.49%	93.84%	86.26%
	O3	80.7	92.9	65.0		O3	90.93%	93.59%	86.05%

Discussion

The results confirm that improved BRT service could contribute to the achievement of target public transport modal share of 76 percent. Under the pessimistic scenario, this policy target is reached only at destination 2 (D-2), whilst at the optimistic scenario, all sets of origin and destination could reach above 76 percent of the policy target. In all the scenarios, major interventions are required especially to reduce travel time to 55–65 minutes. This could be done by combining all three infrastructure interventions—i.e., sterile dedicated lane, provision of passing places, and bus priority signal.

In addition, the result of modal shift to the BRT, which varies from 3 percent to 94 percent from the pessimistic to optimistic scenarios, is subject to further combined interventions. From the preference survey, some additional interventions might be required to attract more car users and, therefore, turn the pessimistic and moderate into more optimistic results, with the following priority improvements on (1) the quality of the bus and reliablity of the schedule; (2) the standard operating procedure and, therefore, the overall service; and (3) safety.

Our findings in general are in line with previous research on BRT modal shift preference. Khan, *et al.* (2007) also disclosed that the vehicle travel time is the most influencing factor for car users to shift in the Brisbane CBD corridor. Moreover, Nkurunziza, *et al.* (2012) stated that in a developing country (study case: Dar es Salam, Tanzania), comfort is the most valued attribute on how commuters perceive and value the proposed BRT service quality compared to travel time and travel fare. Our survey, which also outlines the priority factors, supports those suggestions to combining all critical success factors for shifing. Moreover, demand for express and direct bus service based on origin–destination of passengers was also demanded by existing BRT users in other corridors (Romadhona and Triyana, 2010).

In sum, the demand for such services has some policy implications and several preconditions. First, excellent infrastructure is the prerequisite to facilitate minimum travel time. Second, as infrastructure is the main success factor, the policy measure is beyond TransJakarta Authority. Therefore, cooperation among cities, districts and provinces, and sectors is critical. Since mobility of passengers in Greater Jakarta is also across provincial boundaries, a higher level of authority (national/subnational) is also required for the success of public transport revitalization.

Conclusion

The results confirmed that BRT service improvement could contribute to the achievement of the target modal share of 76 percent. This could be done by combining all three infrastructure interventions, i.e., sterile dedicated lane, provision of passing places, and bus priority signal.

Using the utility function provided, further reseach should be done to understand the extent of available infrastructure to support the BRT at the level of preferred service by potential users.

The demand for such improved services has some policy implications and several preconditions which involve provision of excellent infrastructure and a requirement for collaboration among cities, districts and provinces, and sectors as well as a higher level of authority (national/subnational).

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