

MEASURING THE EFFECT OF JAKARTA-CIKAMPEK TOLL CONGESTION TOWARDS CONSUMERS TRAVEL CHOICE

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Abstract. Jakarta Cikampek Toll Road is one of the famous toll roads in Indonesia that has been established since 1988. Unfortunately, due to the increasing number of vehicles each year, traffic congestion has begun. This traffic congestion can affect the travel time and travel cost which has been regarded as one of the most fundamental determinants of both short term and long term travel decisions. The objective of this research is to find out factors influencing consumer mode choice decision during severe traffic congestion in the toll road. We design the stated preference questionnaire with four alternative modes, car, travel shuttle, train, and bus using d-efficient design using NGENE software. The attributes for those four alternative modes are travel time, cost, congestion time, waiting time, access egress time and cost. In our questionnaire, the respondents are asked to answer their most likely chosen mode from eight possible attribute combination scenarios.

Keywords : Traffic Congestion, Consumer Travel Choice, Jakarta-Cikampek Toll.

INTRODUCTION

Toll roads have become an important element needed by a country, especially for the economic development of the developing countries. One of the most widely used toll roads in Indonesia is Tol Jakarta-Cikampek which has been established since 1988 (BPJT, 2012). This toll road has a major impact on Indonesia's economic development, especially from the transportation and logistics sector. This is due to the Toll Road connects up to four major cities, such as Jakarta, Bekasi, Karawang, and Cikampek. However, due to the increase in the number of vehicles each year, traffic congestion has begun, especially in the Jakarta - Cikampek Toll Road itself. This is in accordance with the fact that there is rapid population growth in the developing countries and followed also by a rapid increase in car ownership (Belgiawan, et al., 2014). For example, in Indonesia, the amount of private cars increased in the same period from 7 to 37 cars per 1,000 people (Oak Ridge National Library, 2016).

Traffic congestion itself can directly affect the travel cost and travel time itself which has been regarded as one of the most fundamental determinants of both short term and long term travel decisions (Fujii & Kitamura, 2000). This congestion might directly impact on the transportation choice that usually use Jakarta-Cikampek Toll Road as their main route such as private car, travel, and bus. Usually, consumers will make decision to achieve their goals. These goals include choosing the best option among the alternative choices which can maximize their utility. Therefore, during severe congestion, many users of the Jakarta - Cikampek Toll Road are looking for other alternatives to accelerate and facilitate their journey. For example, there are an exceed demand for train as stated by Agus Dwinanti as Vice President Passenger Marketing PT Kereta Indonesia Persero where the occupancy of Jakarta-Bandung train in weekdays can be more than 70% even 100% in the highest point (Susanti, 2018). According to Kotler and Armstrong (2016), the travel decision process consists of five stages which are need recognition, information search, evaluation of alternatives, the choice, and post purchase behaviour. Hence, based on the problem which already stated, the researcher has some objectives of this study. First, the objective is to prove does the congestion factor affect consumer travel choice or not. Then, if it is proven, the researcher also want to determine how does Jakarta-Cikampek Toll congestion affect consumer travel decision. These objectives has a purpose to minimize the rate of traffic congestion in Jakarta-Cikampek Toll Area and give more utilize to travel user who usually go through Jakarta-Cikampek area.

LITERATURE REVIEW

Traffic Congestion

According to Meriam Webster (1978), traffic congestion is a situation in which a long line of vehicles on a road which has stopped moving or moving very slowly. At the time of congestion, the degree of saturation on the road segment where congestion occurs reaches the degree of saturation more than 0.5 (IHCM, 1997). Traffic congestion on the highway segment occurs when the flow of traffic vehicles increases with increasing travel demand in a certain period, and the number of road users exceeds the existing capacity (Meyer et. Al., 1984). Bull (2003) states that in recent years, the increase in the demand for transport and the increase in road traffic have caused serious congestion, delays, accidents, and environmental problems. Traffic congestion itself has become a veritable scourge which plagues developing nations and industrialized countries (Bull, 2003).

Cause of Traffic Congestion

According to Bull (2003), there are four causes of traffic congestion. The first one is characteristic of urban transportation such as a large number of journeys are concentrated in one road segments, because of the desire to make the best use if the hours of the day to carry in the various types of activities and have an opportunity to make contact with other persons. The second is private car users. Some vehicles cause more congestion than others. Bull (2003) also stated that from transport engineering, each type of vehicle is assigned a passenger car equivalence called passenger car units or pcu. A bus is normally considered to be equivalent to 3 pcus and truck to 2 pcus. Meanwhile, a private car user is equivalent to 1 pcu. Although a bus causes more congestion than a private car, it generally carries more persons. The third one is design and maintenance problem such as road surfaces in bad condition, and especially the presence of potholes, give rise to increasing constraints on road capacity and increase congestion. Finally, driving habits such as a vehicle which is stopped or moving sluggishly affect the smooth flow of traffic since it blocks a traffic lane.

Consumer Travel Choice Decision

Adapted from Mathieson and Wall (1982) which is the travel decision-making model, there are three phases of travel decision making, which are a pre-trip phase which can be defined as the phase which will be faced by someone before she/he does a traveling. It usually consists of introductions of traveling wants/ demands. It consists of introductions of traveling wants/ demands, gathering information and evaluation. The second phase is during trip phase which can be defined as the phase where the travelers feel the travel experiences, and it usually includes the accommodation, food consumption, attraction, and transportation as the consumption in the scope of travel. Third, the post-trip phase can be conducted after the travel activities have been accomplished where it can conclude the satisfaction rate towards their previous travel experiences. Then, it will influence the next consumers' behavior based on their previous travel activities' evaluation

METHODOLOGY

Data Collection

In conducting the research, the researcher conduct a quantitative approach in data collection phase and only uses primary data. The primary data can be defined as the data that collected for specific research issue and using proceduers that suits the researcher issueis gathered from the result of questionnaire analysis (Hox & Booeije, 2005). The primary data itself will be obtained from questionnaire that spread to Jakarta-Cikampek Toll Road users who usually used Jakarta - Cikampek Toll Road area as their main route. The population of this research is every Jakarta- Cikampek Toll Road users which located in Bandung and Jabodetabek area even though there is no specific data of Jakarta – Cikampek Toll Road users that located in Bandung and Jabodetabek area. However, according to Jasa Marga Annual Report (2015), there are 563.000 users of Jakarta-Cikampek Toll Road. In terms to measure the sample size for data collection, we use convenience sampling method through Cochran Formula. The sample size that we got is 384 respondents. Unfortunately due to the time constraints, the researcher only got 131 respondents that is obtained through questionnaire.

Questionnaire design

To enhance the questionnaire design, the researcher use discrete choice model. Since, in this research, it has one dependent variable and several independent variables. According to Train (2009), Discrete choice model is able to model the decision makers' choices among several alternatives. The decision makers are usually people, households, firms, or any other decision-making unit, and the alternatives might represent competing products, courses of action, or any other options and items, over which choices must be made by the decision makers. To make a decision maker easier to decide their alternatives, the researcher will make a scenario based on D-efficient or design of experiment that is will be utilize by NGENE Software (Bliemer, Rose, & Hensher, 2009) . The number experiment designs depends on the number of alternatives, attribute, and level attribute itself. The design of experiment can be seen in table 1.

Table 1 Alternatives, attributes and their values for SP experiments

Attributes	Car	Travel	Train	Bus
Travel time (hour)	2, 2.5, 3	2.5, 3, 3.5	3	3, 4, 4.5
Travel cost (IDR 1 K)	150, 250, 300	110, 125, 165	110, 150	40, 50, 52
Waiting time (minute)	NA	10, 15, 25	20, 30, 40	10, 15, 25
Access and egress (minute)	NA	18	18, 30	33
Access and egress cost (IDR 1 K)	NA	4, 10	9, 11, 20, 22	18, 20, 36, 40
Congestion time (hour)	5.5, 6.5, 7.5	6.5, 7.5, 8.5	NA	7.5, 9, 9.5

As can be seen in Table 1, the attributes are travel time, travel cost, waiting time, access, and egress time and cost, congestion time which is owned by every transportation mode as stated by Belgiawan, et.al., (2018). The result is 24 scenarios that has been developed using NGENE software. Then, these scenarios will be divided into three types of the questionnaire, each with eight different scenarios were made. The questionnaires also is distributed to the target market in several areas. Lastly, to analyze the data, we decided to use MNL Model. (Ben-Akiva & Lerman, 1985)

FINDINGS AND ARGUMENT

In total, we already obtained 131 respondents, thus with eight scenarios per respondent, we have in total 1048 observations. After obtained the data, we analysed it using MNL model where the result can be seen in Table 2. Then, to simplify the result analysis the attributes that which only picked by researcher are those who meets with criteria t-test robust is value is should be between $1.96 < x < -1.96$ or P-value below than < 0.5 (Train, 2009) on table is don't have marked (*). We choose private car as our base category for this MNL Model since this is the main travel mode that is used in Jakarta-Cikampek Toll Road. The result started with alternative specific constant results which means the conditions is all else being equal. From the result, we can see that alternative specific constant (ASC) of travel and train have significant effect. This means all else being equal, people might choose travel or train than private car. Then, the attributes result started where private car travel time has a negatively significant value where it can implies that if there is an increase in private car travel time, people will look for other alternatives with more utility. For Train cost and train travel time, they have a negatively significant value which means that if there is an increase in train travel cost or travel time, people will not use train and vice versa and people might be choose private car than train. Surprisingly, the bus travel cost has a positive significant value where it means that if bus travel cost increase, people will prefer to use bus. It can be assumed that if the bus travel cost increase, it might implies of the increase in bus facility which gives people more comfortability. Meanwhile, if bus travel time increase, people will prefer to choose other alternatives which proven by bus travel time value. Last, the only attributes that significant to travel is only travel's travel time. In the table 2, it can be seen that travel's travel time has negatively significant value which implies that if there is an increase of travel's travel time, people will less likely to use travel and prefer to choose private car or other travel options.

Table 2 MNL Model Results

Name	Estimate	t-test	
Alternative Specific Constant Travel	-0.811	-0.75	
Alternative Specific Constant Train	-0.123	0	
Alternative Specific Constant Bus	-7.23	-2.61	*
Private Car Travel Cost	-0.00479	-2.95	*
Private Car Travel Time	-0.85	-3.68	
Train Travel Cost	-0.00794	-1.91	
Train Travel Time	-0.369	0	
Bus Travel Cost	0.0474	1.11	
Bus Travel Time	-0.142	-0.41	
Travel's Travel Cost	-0.0134	-2.79	*
Travel's Travel Time	-0.312	-1.57	
*= Not Significant			

CONCLUSIONS

Based on our finding and arguments, we can conclude that most of our respondents are concern about the travel time and travel cost attributes, especially for the transportation mode which use Jakarta-Cikampek Toll Road as their main route. It can be seen that the most outstanding transportation mode is train. Traffic congestion is something that we cannot be expect, so it can be concluded that people will try to find something that has more utility and give them expected situational factor to evaluate their alternatives. It is supported by Kotler and Armstrong (2016), where unexpected situational factors may change the consumer decision. Therefore, the researcher can conclude that train is the most capable options to face this condition since it has a constant travel time and has no congestion time. It also will be a good opportunity towards train company where it is also supported by (Susanti, 2018) that there is a exceed demand in train in Jakarta-Bandung area. From this, we can recommend PT. Kereta Api

Indonesia as the train company to add more train fleet to fulfil the demand and also improve their quality to attract more travel consumers. However, this can also be an input for PT. Jasa Marga as Jakarta-Cikampek toll road operators to improve the quality of facilities and services that they present so that toll road users can drive comfortably. We recommend that PT. Jasa Marga as state-owned company to coordinate with government in making a to make regulations about the hours of trucks through the Jakarta-Cikampek toll road and the hours of maintenance or projects in Jakarta-Cikampek area, since one of the factors that causes one of the factors that caused Jakarta-Cikampek Toll congestion is the high number of freight factors that are one of the major contributing factors because of its low speed and maneuverability and several projects which can caused unexpected traffic congestion and change in number of lanes in toll road. Following the Jasa Marga's recommendation, to increase the comfortability of travel consumer that usually traveling through Jakarta-Cikampek area, the researcher recommend the travel consumer to follow the information about traffic congestion in Jakarta-Cikampek area. If there is already a rule about the hours of trucks through the Jakarta-Cikampek Toll Road or ongoing project, it is better for travel consumer to avoid using transportation choice that use Jakarta-Cikampek Toll Road as their main route. (Private Car, Travel, and Bus). This recommendation also more addressed to private car user where it is better to use public transportation such as train which is have a constant travel time and has no congestion time attributes. The researcher can stated that it can help to decrease the level of traffic congestion in Jakarta-Cikampek Toll Road since private car will cause more congestion than bus or other public transportation because private car has a less pcu or passenger per unit than bus or travel as stated by Bull (2003). The researcher also realise that there are a scope and limitation in this research which is the presence some current condition that cause of Jakarta-Cikampek Toll Congestion and limitation of the respondents. One of the conditions is the several ongoing projects in Jakarta-Cikampek Toll Road that might be finished in the future and the respondents condition who only limited by people that is traveling through Jakarta-Bandung area. So, the researcher think that the future research can analyze the condition after all the projects in Jakarta-Cikampek Toll Road is finished or can be implemented towards other objects such as Cipali Toll Road and etc.

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