Consideration of Flexible Temporal Constraint on One-Day Shopping Travel Behavior: Daily Praying Time in Islamic Countries

Muhammad Isran RAMLI
Doctoral Course Student
(Lecturer of Hasanuddin University)
Graduate School of Engineering
Urban & Environment. Engineering Depart.
Kyushu University, 7-4-4, Motooka,
Nishi-ku, Fukuoka, 819-0395 Japan,
Telp/Fax: +81-92-802-3403
E-mail: ramuri@civil.doc.kyushu-u.ac.jp

Yoshinao OEDA
Associate Professor
Graduate School of Engineering
Urban & Environment. Engineering Depart.
Kyushu University
7-4-4, Motooka, Nishi-ku, Fukuoka,
819-0395 Japan
Telp/Fax: +81-92-802-3403
E-mail: oeda@civil.doc.kyushu-u.ac.jp

Tomonori SUMI
Professor
Graduate School of Engineering
Urban & Environment. Engineering Depart.
Kyushu University
7-4-4, Motooka, Nishi-ku, Fukuoka,
819-0395 Japan
Telp/Fax: +81-92-802-3403
E-mail: sumi@doc.kyushu-u.ac.jp

Chiaki MATSUNAGA
Assistant Professor
Graduate School of Engineering
Urban & Environment. Engineering Depart.
Kyushu University
7-4-4, Motooka, Nishi-ku, Fukuoka,
819-0395 Japan
Telp/Fax: +81-92-802-3403
E-mail: matunaga@civil.doc.kyushu-u.ac.jp

Abstract: This paper attempts to describe flexible temporal constraint as specific behavior on one-day shopping travel in Islamic countries, namely daily praying time constraint. In further, the paper take into account the constraint to develop a choice model of leave time from shopping place. The model is derived from minimization of three types of disutility that available during a traveler stays at shopping place and arrives at a destination place, i.e., disutility of shortage stay time at the place, disutility of lateness leave time from shopping place, and disutility of the time constraint as consequence of availability of the temporal constraint during period time of a set origin-destination trip. In order to estimate parameters values of the model, a trial and error process method based on simulation approach was applied. The model was applied to the two categories of shopping centre visitors i.e., car user and motorcycle user categories respectively. By using a goodness of fit test, the proposed model was acceptable. The parameters values show that response of the car users to start the praying activity is later than the motorcycle users. In contrary, durations of the motorcycle users to conduct the constraint activity are later or longer than the car user category. The flexible temporal constraint also can be applied to develop a departure time, trip pattern and mode choice model in further studies.

Key Words: *Flexible temporal constraint, praying time, shopping, travel behavior*.

1. INTRODUCTION

In recent years, research to non work travel in particular shopping travel found out more and more attention. At least there are some reasons for this condition, i.e. the shopping trips contribute increasingly large proportion to urban trips recently, especially on peak periods, the trips have more temporal flexibility of individual than work trips (Bhat and Steed, 2002), and the trip provides more or less congestion and some kinds of environmental problem in the centre business district, CBD of city (Ramli *et al.*, 2010).

For the above reason, this paper attempts to describe a specific behavior of flexible temporal constraint of individuals who conduct one-day shopping travel. In this regard, the research

adopts and develops a disutility model approach. Many previous studies have given attention related to the non-work trips which used disutility model approach. Some of them proposed a model to consider the one day life cycle for non-work trips (Sumi *et al.*, 1994) and it was expanded to take account for more short time behavior (Sumi *et al.*, 1995), and for the travel with a series of plural destinations (Ooeda *et al.*, 2005). In further, the model provided a basis for taking account of excess-day travel (Ooeda *et al.*, 1997) and for taking account of the frequency of a non-work trip (Chen *et al.*, 2004; 2005). In the last of previous research, the authors of this paper have proposed choice model of departure time for trip to shopping place for certain purpose (Ramli *et al.*, 2010). The model in particular, regard to daily shopping trip which consider lunch activity in around noon as temporal constraint of travelers to decide their departure time.

Furthermore specifically, concerning to one-day shopping activity-travel, individuals face capability and authority constraints to be considered to decide their time attributes of the travel. Commonly, travel to shopping place is restricted by lunch time in noon and dinner time in evening, while opening time of shopping place during 10:00 a.m. to 10:00 p.m. So, travel to shopping place should be done in the time-frame restrictions. However, many people in particular travelers in Islamic countries choose their time attributes to do shopping activity-travel not only consider lunch time in noon and or dinner time in evening but also consider specific flexible temporal constraint for the daily obligations in afternoon until evening, such as praying time, pick-up time for children, etc. In this regard, this paper emphasizes to study the effect of the praying time constraint as a flexible temporal constraint on one-day shopping travel. The different of people to respond the time cause the different decision choosing related to time attributes of a shopping travel, such as departure time from home or origin place, arrival time and leave time from shopping place, and arrival time at home or destination place from shopping pace.

In order to describe the effect of the specific flexible temporal constraint to decision behavior of individuals on one-day shopping travel, this research proposes and emphasizes the development of a choice model of leave time from a shopping place that considers the temporal constraint, i.e. praying time constraint, in the model. The model being developed is based on minimization of some types of disutility that individuals face during their stay at a shopping place and arrival at a destination place.

The rest of this paper is organized as follows. Chapter 2 develops the structure of choice model of leave time from shopping place based on the disutility model approach that take into account the flexible temporal constraint, the praying time. Chapter 3 demonstrates the application of the model. The final chapter, Chapter 4 provides discussion related to the result of the model implementation and concludes.

2. DEVELOPMENT OF MODEL STRUCTURE

2.1. Praying Time Constraint as Flexible Temporal Constraint on One-Day Travel

In context of human activity-travel patterns, an individual is constrained by three restrictions (Hagerstrand, 1970): (1) capability constraints, (2) coupling constraints, and (3) authority constraints. The first constraint means that people have constraints related to physiological characteristic and current travel mode, such as: a person has to have sleep time at least 6 -8 hour, have meals three times in a day, etc. The second constraint means that individuals have to exist at specific time and location, such as an employee has to exist at his/her office to work

from 9:00 a.m. until 5:00 p.m. The last constraint means contrary with the second constraints, whereas people cannot exist at specific time and location. In example, an individual should only shop at a shopping place during the opening time of the place.

Related to capability and authority constraints, there is a specific situation of travelers on one-day shopping travel to choose their time attributes of decision trip in the Islamic society comparing to another behavior of people. The travelers in Islamic countries choose their decision of time attributes to do the shopping activity not only consider lunch time in noon and or dinner time in evening but also consider specific time for the daily obligations in noon through in evening, namely praying time. In this time period, people who have Islamic religion, have to conduct three kinds of obligation of praying activity, i.e. "*dhuhur*", "*ashar*", and "*magrib*" praying. The individuals do the three in flexible temporal constraint, where each the obligations need to 5 – 15 minutes to do it. The time limitations to conduct the each type of the praying time are 12:00 – 15:00 o'clock, 15:00 – 18:00 o'clock, and 18:00 – 19:30 o'clock for "*dhuhur*", "*ashar*", and "*magrib*" praying time respectively, as shown by Figure 1. Usually, people do the "*dhuhur*" praying activity with be included into lunch time as well as the "*magrib*" praying activity be included into dinner time. Differently from both praying activity, people have specific behavior to do the "*ashar*" praying activity. Some of them get the praying earliness or middle the time role, but some of them do the praying at the lateness of the time or their praying time near to the "*magrib*" praying time in the evening. The difference of people to choose the time causes the difference choosing time attributes of their shopping travel such as departure time from home, leave time from shopping place, and or arrival time at home. In later section we will show how the flexible temporal constraint taking account into the choice model of leave time from shopping place.

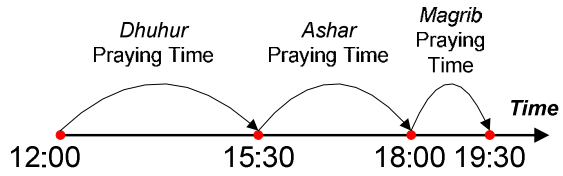


Figure 1 Time period of praying time-activity constraint

2.2. Structure of Disutility Model Development

The structure of the model development is derived from a set time-behavioral process of individuals in order to express their decision during they conduct shopping travel. In this case, their time attributes consist of arrival time through leave time from shopping place and arrival time at destination place of their trip. Generally, people who conduct shopping travel will face two crucial times, i.e. leave time from shopping place and arrival time at destination place. By taking disutility model approach, the model assumes that each individual will attempt to minimize to take all types of disutility that be appeared by the above crucial times. In this paper, the model considers two types of disutility that regarded to property of shopping activity. The first of the two types of disutility is addressed to time duration that allocated by individuals to stay at shopping centre, namely disutility of shortage stay time. The other disutility is related to lateness when individuals arrive at destination place, namely disutility of lateness arrival destination place. In order to represent effect of the praying time as a flexible temporal constraint on one-day shopping travel, the disutility of daily praying time constraint is introduced in this research. Those types of the disutility are shown by Figure 2.

Furthermore, the proposed choice model of leave time from shopping place will be constructed by taking the above disutility model approach. For this reason, some parameters

of the model related to time attributes during stay at shopping centre and arrival time at the destination place will be defined as random variables.

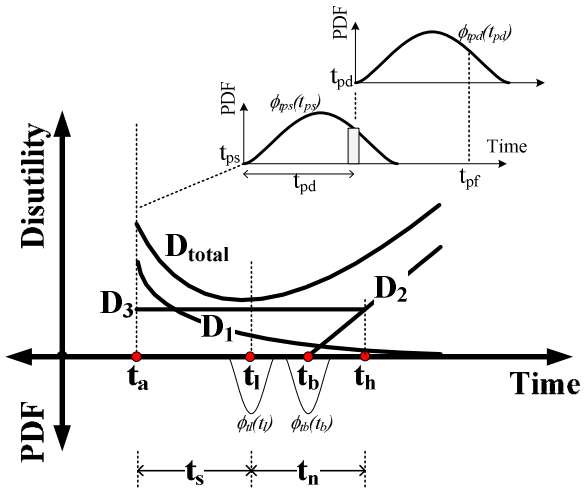


Figure 2 Hypothetical disutility model of one-day shopping travel

The next section will show derivation process of structure of the proposed model based on availability of the above three types of disutility.

2.2.1 Disutility related to duration of stay time at shopping place

According to duration that allocated by individuals at shopping place, the individuals will face disutility of shortage stay time, D_1. In this regard, the individuals are assumed that have enough time to stay at shopping place, so that they will attempt to minimize the disutility. We assume that the value of the disutility decreases to follow exponential assumption respectively as shown by curves D_1 in Figure 2. Then, the disutility is formulated as below.

$$D_1 = e^{-\alpha t_s} \tag{1}$$

Where t_s is stay time at shopping place, while α is positive parameter.

2.2.2 Disutility of lateness arrival time at destination place from shopping place

In this regard, individuals are assumed that have designed a threshold time to arrive at a destination place from shopping place. The threshold time is time point when they will suffer the disutility of lateness arrival at the place or not. Let to denote the arrival time at the destination place as t_h, and the threshold time as t_b. Then, the individuals will take a disutility when their arrival time at the destination place later than the threshold time. The value of the disutility is assumed linearly increase as shown by curve D_2 in Figure 2. The expression of the disutility can be stated as follows:

$$D_2 = \begin{cases} B(t_h - t_b).....(t_h > t_b) \\ 0.....(t_h \le t_b) \end{cases} \tag{2}$$

Where, B is positive parameter.

2.2.3 Disutility of praying time constraint during one-day shopping travel

In this paper, a specific additional disutility is introduced that regard to availability another constraint in shopping activity-travel behavior, i.e., disutility of specific time for daily praying

time activity in noon until evening. As explained in the previous section, there is a different situation of many travelers where they consider not only lunch activity constraint, but also the constraint during noon until evening (namely praying time) when they would like to decide their departure time from home or origin place to shopping place. The disutility can be expressed as similar to the disutility of lunch. In this way, lets to define of start and end praying time during noon through evening as t_{ps} and t_{pf} respectively. Hence, the disutility can be formulated as below:

$$D_3 = \frac{1}{t_{pf} - t_{ps}} \tag{3}$$

2.3 Choice Model of Leave Time from Shopping Place

According to assumption that individuals will decide or choose their leave time from shopping place due to minimize a numerous types of disutility that be faced, and assumption that the all types of disutility can be added each other, then the total disutility will be suffered by individuals can be derived step wisely as below.

Let to denote D_{12} as the total disutility of D_1 and D_2, and the disutility can be wrote as follows:

$$D_{12}(t) = D_1(t_s) + D_2(t_h) \tag{4}$$

In the first step, the individuals are assumed that do not suffer disutility of lateness arrival time at destination place. So that, the Equation (4) can be rewritten as follows equation:

$$D_{12}(t_s) = D_1(t_s) \tag{5}$$

Where the minimum value of the disutility can be achieved under condition below:

$$\left.\frac{D_{12}(t_s)}{dt_s}\right|_{t_{so}^1} = 0, \qquad (t_b \geq t_h) \tag{6}$$

The second step, the model considers that the individuals take the disutility of lateness arrival time at destination place into account of the total disutility. With regarding that there is relationship among variables related to time as follows:

$$t_h = t_l + t_n \tag{7}$$

$$t_l = t_a + t_s \tag{8}$$

Where t_a and t_n are arrival time at shopping place and travel time from shopping place to destination place respectively.

So that, the Equation (4) can be rewritten as function of t_s as follows equation.

$$D_{12}(t_s) = D_1(t_s) + D_2(t_s) \tag{9}$$

The minimum value of the total disutility can be achieved under condition below.

$$\left.\frac{D_{12}(t_s)}{dt_s}\right|_{t_{so}^2} = 0, \qquad (t_b < t_h) \tag{10}$$

Therefore, the distribution of leave time from shopping place for the both steps can be formulated as follow equation.

$$\phi_{tl}^1(t) = \frac{1}{t_b - t_{l0}^1}, \qquad (t_b \geq t_h) \tag{11}$$

$$\phi_{tl}^2(t) = \frac{1}{t_b - t_{l0}^2}, \qquad (t_b < t_h) \tag{12}$$

Where t_{lo}^1 and t_{lo}^2 are constant values that given by equation below.

$$t_{l0}^1 = t_b - t_a - t_{s0}^1 \tag{13}$$

$$t_{l0}^2 = t_h - t_b - t_a - t_{s0}^2 \tag{14}$$

To this end, every individual is regarded that his or her decision of leave time from shopping place is conditional on stay time at the place, and the time is a constant value.

2.4 Leave Time Choice Model which Consider Dispersion of Choice Behavior

In order to represent phenomena in the real word, whereas individuals inconsistent to their decision even they face the same condition and situation, as consequence availability of occasional different and various human characteristics, then we have to define some variables of the above models as random variables. Hereafter, every decision-making shall be regarded that it is conditional on stay time in order to consider group of individuals and availability of stay time distribution.

Therefore, in this research the parameters α and t_b are defined as random variables in order to express dispersion of stay time at shopping place and arrival time at destination place respectively. Their probability density functions (PDF) are denoted by $\phi_{tb}(t_b)$ and $\phi_\alpha(\alpha)$ respectively, and the distributions of the parameters are assumed independent to each other and conditional to given certain travel time, t_n.

Regarding the above assumptions, the Equation (11) and the Equation (12) are rewritten into the following expressions.

$$\phi_{tl}^1(t|t_n) = \int_{-\infty}^{\infty}\int_{t_{b0}^*}^{\infty} \frac{1}{t_b - t_{l0}^1}\phi_{tb}(\tau)\phi_\alpha(\alpha)d\tau d\alpha, \qquad (t_b \geq t_h) \tag{15}$$

$$\phi_{tl}^2(t|t_n) = \int_{-\infty}^{\infty}\int_{t_{b0}^*}^{\infty} \frac{1}{t_b - t_{l0}^2}\phi_{tb}(\tau)\phi_\alpha(\alpha)d\tau d\alpha, \qquad (t_b < t_h) \tag{16}$$

The distributions of arrival time at shopping place for a given travel time, t_n, and arrival time at destination place, t_h, are given as follows.

$$\phi_{ta1}(t|t_n) = \phi_{tl1}(t - t_n), \qquad (t_b \geq t_h) \tag{17}$$

$$\phi_{ta2}(t|t_n) = \phi_{tl2}(t - t_n), \qquad (t_b < t_h) \tag{18}$$

Due to those above distributions have limitation from the time constraints in the parentheses they are not PDFs in normal sense. Then, the PDFs of leave time and arrival time at shopping place are given by the sum of the Equation (15) and (16), and the Equation (17) and (18) respectively as follows.

$$\phi_{tl}(t_l|t_n) = \begin{cases} \phi_{tl1}(t|t_n) \text{.....} (t_b \geq t_h) \\ \phi_{tl2}(t|t_n) \text{.....} (t_b < t_h) \end{cases} \tag{19}$$

$$\phi_{ta}(t_a|t_n) = \begin{cases} \phi_{ta1}(t|t_n) \text{.....} (t_b \geq t_h) \\ \phi_{ta2}(t|t_n) \text{.....} (t_b < t_h) \end{cases} \tag{20}$$

In order to take account of a human group with PDF of travel time distribution, $\phi_{tn}(t_n)$, Equation (19) and Equation (20) can be restated as below:

$$\phi_{tl}(t_l) = \int_0^\infty \phi_{tl}(t|t_n)\phi_{tn}(t_n)dt_n \tag{21}$$

$$\phi_{ta}(t_a) = \int_0^\infty \phi_{ta}(t|t_n)\phi_{tn}(t_n)dt_n \tag{22}$$

The above arguments lead to a complementary calculation is possible to be done. In later, this paper will show comparing leave time distribution derived from the above equations to observed leave time distribution.

2.5 Leave Time Choice Model which Consider Daily Praying Time Constraint

When effect of the praying time constraint is considered on the leave time decision, the model becomes much complicated. Let to denote start time and time duration of the activity constraint as t_{ps} and t_{pd}, and the distribution of both as $\phi_{tps}(t_{ps})$ and $\phi_{tpd}(t_{pd})$ respectively. Then, the probability of that a given arrival time is included in the praying time constraint, P_P, is obtained by the multiplication of the probability of the activity has already started and the probability of the activity is still continuing. The probability can be stated as follows.

$$P_P(t_a) = \int_{t_a-\tau}^{t_a} \phi_{ps}(\tau) \int \phi_{pd}(s)dsd\tau \tag{23}$$

If the arrival time or the leave time is included in time of the activity constraint, the travel simply is assumed to be restricted. The distributions of the leave time and the arrival time are corrected as follows.

$$\phi_{t_l}^{c}(t_l) = \{1 - P_P(t_l)\}\phi_{t_l}(t_l) \Big/ \int \{1 - P_P(\tau)\} d\tau \tag{24}$$

$$\phi_{t_a}^{c}(t_a) = \{1 - P_P(t_a)\}\phi_{t_a}(t_a) \Big/ \int \{1 - P_P(\tau)\} d\tau \tag{25}$$

3. APPLICATION OF MODEL

The proposed model can be applied to traveler especially for people who conduct one-day shopping travel that consider praying time constraint as flexible temporal constraint to their decision. Concerning to one-day shopping travel, travelers are not necessary to late for arrival time at destination place from shopping place for most cases of shopping travel-activity. In other word, individuals usually avoid to take disutility of lateness arrival time at the destination place. Therefore, we can simply the model to apply to this behavior. In this regarding, Equation (16) and Equation (18) does not need to be applied, so that traveler's behavior can be expressed enough by Equation (15) and Equation (17). Thus, the parameters which are used to represent the behavior of travelers are only t_b, α, t_{ps}, and t_{pd}. The next sections will explain application of the above simplification model.

In order to apply the model, a calculation method was developed as well as a survey was done to a case on one-day shopping centre travel at centre business district (CBD) in Makassar city, Indonesia, the biggest country that majority of its citizen practice Islamic religion as well as they have to conduct praying time. This chapter will explain the process and the result of both activities.

3.1 Calculation Method to Estimate Parameters of the Model

The calculation method to estimate the model parameters in this research is procedure to find a set of numerals possibly regarded as the parameters, and the calculated values surely depend on the set of assumed initial values. Therefore, the calculation has to have some trial and error process to find the possible parameter values. The following method was applied for this purpose.

1) Replace the four parameters, t_b, α, t_{ps}, and t_{pd} that defined as random variable before, with their average and standard deviation values, μ_{tb}, σ_{tb}, μ_{α}, σ_{α}, μ_{tps}, σ_{tps}, μ_{tpd}, and σ_{tpd}, respectively. Then, give the initial values for the eight parameters.
2) Generate a set of large numbers of random numerals using the average and standard deviation for each the parameters.
3) Calculate the arrival time and leave time and their distribution by using taking one of the numerals for each parameter that conditional to a certain value of travel time. Repeat the procedure until the set of random numbers are all taken into account.
4) Repeat the step (3) for the changing values of travel time according to the observed distribution until the full range of travel time is covered.
5) Weight the leave time distribution by sharing with travel time distribution, and suppose them so that the leave time distribution is obtained for all members of the group.
6) Compare the calculated distribution of leave time with the observed one, and calculate the square difference between them.
7) Change the assumed values of the parameters in an iterative manner to reduce the square difference. In that matter a certain type of non-linear optimization programs is used to reduce square difference.

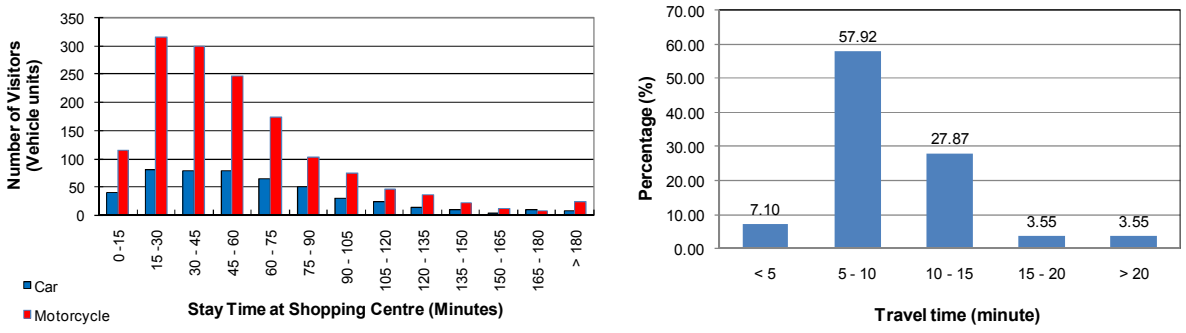
8) Stop the calculation when the variation of the parameters become enough small and regard the assumed values as the estimated values for the parameters.

3.2 Implementation of Survey

The application of the model was done to travelers of one-day shopping centre travel in Makassar City, Indonesia, one of the biggest Islamic countries that majority of its citizen have to conduct the daily praying activity. The condition of travelers for shopping travel is good to implementation the proposed model. By consideration the large number of data for the travel, Makassar Trade Centre (MTC), one of the most crowded of shopping centre that located and available at CBD in the city, was chose as case location. Due to condition of the shopping centre location and also limitation to observe customer directly in term of individually, then a parking survey to the MTC's customers who used car and motorcycle was implemented. In this matter, the number of customer in term of person is simplified and substituted by number of customer in term of number of vehicle. The parking survey was done by using recording method to vehicle plate number, whereas surveyor recorded arrival time and departure time of each vehicle at and from parking area of the shopping centre. The survey was conducted during 10:00 am until 10:00 pm. There were 496 units of car and 1477 units of motorcycle that recorded during the one day survey on Saturday. In order to observe travel time, a survey using questionnaire based on interview method was done to 367 individuals who were visiting at the shopping centre.

3.3 Results of Survey

The result of the survey related to primary time attributes (i.e. stay time and travel time) of travelers on shopping centre travel at Makassar Trade Centre, MTC, in Makassar City is described in the Figure 3a and Figure 3b for the each attribute respectively.



a. Stay time b. Travel time

Figure 3 Attribute time of visitors at Makassar Trade Centre

Figure 3a describes distribution of stay time attribute at the shopping centre of individuals that used car and motorcycle. The Figure shows that there is similarity of distribution pattern of stay time attribute for the both categories of the visitors, i.e. they have peak period of stay time at 15 – 30 minutes, 30 – 45 minutes, and 45 – 60 minutes. Figure 3b shows distribution of travel time for the visitors of the shopping centre according to result of interview survey. The figure shows that the travel time of individuals is dominated by travel time 5 – 10 minutes and 10 – 15 minutes from their origin place to shopping centre, or contrary.

3.4 Results of Calculation

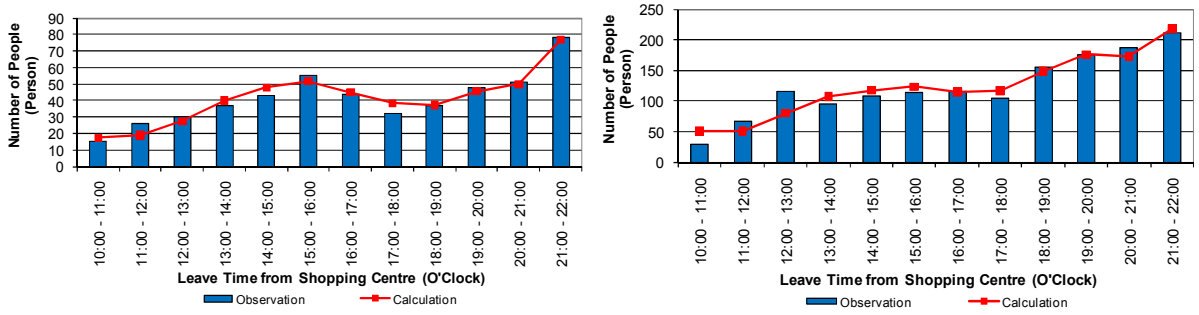
The estimated parameters values of the model for the both categories of the shopping centre's visitor by using the calculation method that was developed in the previous section are shown in Table 1. The table also shows a numerous the statistics parameters i.e., the minimized

square difference values, R^2_{Min}, and fitness of the calculated and observed leave time distributions by using chi-square, χ^2, test, and, *Kolmogorov-Smirnov*, *KS*, test.

Table 1 Result calculation of parameters values

Parameters of model	**Category of Customer**	
	Car	Motorcycle
μ_α	-0.3704	-0.2899
σ_α	0.30101	0.2010
μ_{tb}	17.2579	17.2752
σ_{tb}	2.7757	2.8216
μ_{tps}	14.8223	13.3784
σ_{tps}	0.8405	1.4331
μ_{tpd}	5.4204	6.7540
σ_{tpd}	0.8633	0.8868
Number of Data	496	1,477
Square $Error_{min}$	152.6906	2,837.241
α of χ^2 test (%)	5	-
α of KS test (%)	20	20

The leave time distributions that resulted from the calculation are shown in Figures 4. It was stated that the calculation reproduced the observed distributions well though the *Chi-square* test gave small values of goodness of fit (i.e. 5%) for the car category. However, the test could not reach out for 5% for motorcycle category due to large sample size reason. On the other side, the significant levels of goodness of fit by *KS* test reached 20% for the both categories.



a. Visitors use car b. Visitors use motorcycle

Figure 4 Comparison between leave time of the calculation and the observation

4. DISCUSSION AND CONCLUSION

4.1 Discussion

Comparing the parameters values of the model to each category in the Table 1, there are found slightly different time-behavior properties of individuals between the both categories in order to respond the praying time constraint as flexible temporal constraint on their shopping travel. The different properties of the time constraint include average and standard deviation values related to start time and duration of the activity. However, the standard deviations of duration of the activity constraint are almost similar to the two categories. The difference of parameter μ_{tps} shows that individuals of used car category have behavioral property of start time slower than individuals of motorcycle user category. In contrary, the motorcycle user category has time duration for the activity constraint later or longer than car user category. As consequently of the difference, the both categories also have different to distribution of leave time from the

shopping centre. Figure 4 shows that the leave time distribution of individuals that utilized car category achieves peak later than individuals that utilized motorcycle category in the afternoon period. However, the both categories have similarity phenomenon of the distributions during in the morning through in the lateness evening.

In generally, the result may be stated that the slightly different of leave time distribution is caused of availability of the human property variation related to time-behavioral in order to response stay time at shopping centre, start time and duration of the activity constraint, such as variation of individuals characteristics to asses enough time at shopping place, dispersion to obtain when to begin the time constraint and how long time of the activity constraint, and variation of travel time, etc.

4.2 Conclusion

This paper has introduced a specific flexible temporal constraint, namely daily praying time constraint that is considered by many people in Islamic countries when they conduct one-day shopping travel. In further, the paper has proposed a choice model of leave time from shopping place in order to describe behavioral properties of travelers to respond the temporal constraint of the praying activity. The model considers some types of disutility that available during travelers stay at shopping place and arrive at destination place. In this regard, there are three types of disutility taking account into the model, i.e., disutility of shortage stay time at shopping place, disutility of lateness arrival time at destination place from shopping place, and disutility of praying time constraint during one day shopping travel. The model assumed that the leave time choice from shopping place is decided by travelers according to the minimum value of sum those disutility.

In order to apply the model, travel-activity behavior of travelers for a shopping centre in a city which majority of its citizen have to conduct daily praying activity, was surveyed as case study. This research carried out the survey at Makassar Trade Centre, the most crowded shopping centre on CBD area in Makassar City, Indonesia. Due to limitation to observe individual directly, the survey applied parking survey based on recording of plate number of vehicle for two categories of visitors, i.e. visitor which utilized car and motorcycle respectively. The parking survey involved one day survey from 10:00 a.m. until 10:00 p.m. In other side, a survey using questionnaire based on interview method was done to individuals who are visiting at the shopping centre in order to observe their travel time.

The calculated result by using a trial and error process method based on simulation approach showed that the proposed model can produce a goodness of fit to observed data. In further, there is slightly different behavioral property related to dispersion of praying time constraint between individuals or travelers which utilized private car mode and individuals which used motorcycle. The responses of the travelers show that individuals by using car are later to start the temporal constraint than individuals by using motorcycle. In contrary, individuals by using motorcycle are later or longer to conduct the time constraint than individuals by using car.

In summary, the present paper has described that specific flexible temporal constraint, namely daily praying time constraint as one of factors that limited travelers decision to conduct one-day shopping travel, and successfully to introduce the time constraint into a choice model of leave time from shopping place. The model can be tested further by applying to other situations, and we can expect that it provides a basis to find more advanced and expanded models, such as departure time, trip pattern or destination, and mode choice models in further studies.

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