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Transportation Research Procedia 00 (2018) 000–000

Transportation Research Procedia

www.elsevier.com/locate/procedia

World Conference on Transport Research - WCTR 2019 Mumbai 26-31 May 2019

Factors Affecting Mode Choice in Accessing Railway Station Study in Nakhon Ratchasima

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Abstract

This paper explores the travel mode selection in accessing the railway station. Because the accessibility services were outstandingly undeveloped for over a decade, it is contradicting the growth rate of population and traveling demand. Mode choice investigation would explain the practical suggestion of traveler's behavior. The study will give the result of significant factors, which affected mode choice behavior in the specific study area by using field survey and questioners interview method. The binary logistic regression analysis is the core of the study, another technique, a hierarchical technique, will be applied to gain model performance. The satisfaction factors are representing traveler experience in transport modes accessing the railway station tested in modeling processes. Thus, the results can contribute to a better understanding of the significant factors of transport mode selection, and moreover, the expectation for long-term management and improvement of the public transport systems.

Peer-review under responsibility of WORLD CONFERENCE ON TRANSPORT RESEARCH SOCIETY.

Keywords: Mode Choice, Binary Logistic, Railway Access, Satisfaction ;

1. Introduction

Transportation system development becomes the major topic over the decade. The government has played a very active role in competition among the Association of Southeast Asia Nations (ASEAN) regions and globally, considering economy, society, and communication, especially the dimension of transportation development. In Thailand, the highway infrastructures developed rapidly rather than railway system over nationwide. The growing of private sectors has created transport problems. Traffic accidents have become the big issue, and congestions caused the delays in traveling, which affect social and economic movements. In the positioning of Southeast Asia's transport and logistics hubs, including the policy of regional economic center, the government turns their attention to transport infrastructure, but not only the highways but the railway system must be improved and competes other transport modes by Givoni and Rietveld (2007).

Because of the economic crisis in 2008, the influence of rising fuel and food prices are widely affected on Thai's society, especially people with low income. The consumer price index (CPI) has risen to the highest level of 9 percent. This will have a negative impact on the overall economy of the country. Thus, in August 2008, the Thailand Transport Agencies officially launched the "free train" campaign on the intercity railway services by Ministry of Transport (2015). It aims to reinforce low-income people who use railway services as primary transport as they are the largest proportion of the society. The ability to ride related to household income and expense significantly, the 3rd class railway provided to the public with free of charge services, but for Thai people only. The free service aims to reduce the impact on people in the short term. It covers the travel in Bangkok and its suburbs, as well as people in the regional areas. Recently, the free ride policy remains, but has stepped up the next level such as association

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with the State Welfare Scheme program, the travel allowance is 500 baht per month. The participants in this program can buy a ticket for every train. This campaign has gained travel demand on the railway sector. However, after its launched, a follow-up study has been reported people who come to the service do not meet the target group as the project required, such as those with moderate incomes and near by the residents, but not the low-income people. The results also reflected poor transport system accessibility to access the railway station, as there is limitation. it is one of the reasons railway traveling in Thailand has declined.

Nakhon Ratchasima (NR) is the north-eastern city of Bangkok with 2.6 million population. NR is also the center of interconnection railway between the central and the north-eastern of Thailand. Therefore, the demand for railway passengers and goods would be grown shortly after new railway infrastructure projects are completed. At the NR railway station, the official feeder system does not exist, only local private transport services are available in front of the station, for example, Moto taxi, Tuk Tuk, Sam Lor, etc. They are low capacity transport modes as they occupy one or two passengers per trip. However, some passengers are willing to use a private mode to access railway services instead of the public ones. But in major cities, there are contributes using public transport instead of private by Milakis et al. (2015). In the NR railway station case, passengers have difficulty accessing the station and the quality of service has never been considered by authority. The poor accessibility choice has effects influence on railway passenger in the long term. An efficient access service: ability, connectivity, and accessibility should be considered by Givoni and Rietveld (2007). Also, the connects of urban life, and transport will drive the society by Jung and Yoo (2014). Thus, the limitation of transport modes operating in the city and the quality of service might affect mode choice decision for passengers. This paper provides solutions to improve transport system access to railway station, based on the current exiting travel system. However, in the sustainable transport approach, the study methodology also seeks the solution to increase public transport use over private usage.

2. Methodology

The survey participant's information such as personal descriptive data, trip characteristics, and satisfaction factors, there are tested by binary logistic analysis by Barberan et al. (2017). Also, the reliability of user experience variables investigation is necessary by Debrezion et al. (2009), their recognition of service experiences are respecting separately regarding the travel modes such as private and public transport services to determine the significant factors that affected the individual traveler through mode choices to access the railway station.

2.1. Reliability perspective

Service satisfaction information is an information that gives a sense of satisfaction to the service of a travel model that is inaccurate or is based on personal feelings. The techniques and variables used in the measurement were correlated with the satisfaction of the service selection which is an analysis in the service satisfaction section only. The variables to be tested must be in the same unit or group by using Cronbach's α (Alpha), which is widely used in researches because it is not very complex. The theoretical value of alpha varies from 0 to 1. The satisfaction of the services can be reflected credibility and acceptance levels when the Cronbach's alpha close to values 1, which is the highest reliability.

2.2. Binary logistic

The discrete choice models with two variables consideration as the binary logistic regression (BLR) analyses by Prashker (1988) are performed to estimate the factors affecting passengers' accessibility to the railway. Its statistical method will predict the relationship between a set of dependent and independent variables by Suthar et al. (2010). BLR has the advantage to predict the probability of mode choice, which transforms the limited range of probability into [0,1] by Agarwal et al. (2016) and it will also estimate the slight effect of each descriptive variable. In this model, approach to mode choice access to railway station, the dependent variable can be set as; 1 for respondent chooses private, while 0 for a respondent uninterested in using private transport to access railway station. The random utility model expresses the decision rule base on utility maximization, when U_{in} is the highest utility among J_n alternatives in the choice set C_n, which is an important component of discrete choice or the multi-selective modelling by Prashker (1988). Also probability of any alternative i in the choice of decision-maker n as follow by Akar (2013).

$$U_{in} = \beta_{in} x_{in} + \varepsilon_{in} \tag{1}$$

Where β_{in} is the vector of regression coefficients, x_{in} is an individual explanatory related variable and ε_{in} is the random utility. In this study, the mode choice is defined as public and private transport to access the railway station. The binary logistic function is used for explaining the probability of travel mode choice decisions by Jung and Yoo (2014). The probability of any alternative that afford the highest utility thus the probability of an alternative i being selected from a choice set C_n as follow.

$$P(i|C_n) = P\big(U_{in} \geq U_{jn}\big), \forall j \in C_n \tag{2}$$

As above formula, the random utility model for binary choice can defined as follow.

$$P_n(1) = P(U_{1n} \geq U_{2n}) \quad (3)$$

Therefore, the probability of choosing a mode of travel and interpreted as the probability of the dependent variable, when V_{in} represents the systematic utility of final choice, which consists of alternative i in the choice of decision-maker n is provided as follow.

$$P_n(i) = \frac{exp^{V_{in}}}{\sum_{j \in C_n} exp^{V_{jn}}} \quad (4)$$

The odds number represents success expected to get for every failure on average, also the odds ratio (OR) is defined as the ratio of odds of a descriptive variable and corresponding with exponential of logistic regression coefficient by Rashidi et al. (2017). The OR and their coefficient can be used to describe the relationship of explanatory variables such as gender, household income, and travel time, including the target variable such mode choice decision, which are constructed by the maximum likelihood method by Li et al. (2016).

$$Odds\ Ratio = exp^{\beta_{in}} \quad (5)$$

A variety of equations were derived from the variables used in the questionnaire. Selection of influential variables and possible behavioral optimum of travel patterns by Brons et al. (2009). The utility function is consisted of variables as summarize as:

- Descriptive attribute
    - Gender (0, male; 1, female)
    - Education (0, has a bachelor's degree or higher; 1, otherwise)
    - Employment status (0, employed; 1, not employed)
    - Vehicle ownership (0, yes; 1, no)
    - Age
        - Age 1 (if less than 25)
        - Age 2 (25-34)
        - Age 3 (35-44)
        - Age 4 (45-54)
        - Age 5 (over 54)
    - Income
        - Income 1 (if less than 10,000 baht)
        - Income 2 (10k to 15k baht)
        - Income 3 (15k to 30k baht)
        - Income 4 (30k to 45k baht)
        - Income 5 (more than 45k baht)
- Trip attribute
    - Trip purpose (0, business trip; 1 no-business trip)
    - Trip destination (0, home; 1, otherwise)
    - Travel frequency per a week (0, more than one; 1, otherwise)
    - Party size member (0, more than one; 1, otherwise)
    - Travel baggage (0, more than one; 1, otherwise)
    - Number of transit (Transit; 0, more than one; 1, otherwise)
    - Travel cost (Tcost1; <= 20 baht), (Tcost2; 21-40 baht), (Tcost3; 41-60 baht), (Tcost4; 61-80 baht), (Tcost5; > 80 baht)
    - Travel time (Ttime1; <= 15 min), (Ttime2; 16-30 min), (Ttime3; 31-45 min), (Ttime4; 46-60 min), (Ttime5; 16-30 min)
- Satisfaction of services; Service schedule, ticket service, ticket design, travel time, personal safety, cleanness, quality of service, travel cost, ontime reliability, and accessibility.

3. Data collections

The research was conducted by a survey research using questionnaires. All data was collected from NR railway station in August 2017. The period for an interview was from 8:00-20:00 hours of both weekday and weekend. The interviewers had permission to conduct paper-based survey at passenger's waiting area. The questionnaires were distributed to 547 individual respondents with random sampling method, only 502 effective questionnaires were selected, though 45 questionnaires were invalid. This survey was

mainly designed to collect the personal descriptive and travel characteristics including; factors that impact mode choice selection, satisfaction level which reflected transport modes and their services, and travel mode to the railway station. To analyze characteristics of mode choice behavior, the survey participants were railway passengers, who have had experience on public and private transports by Cheng and Chen (2015). The measurement of the respondent's satisfaction on transport services accessibility to the railway station can be used the satisfaction scale; 1 to 5 represent very dissatisfied to very satisfaction by Brons et al. (2009). Thus, the criteria for the interpretation of mean: 1.00-1.49 is very dissatisfied, 1.50-2.49 is dissatisfied, 2.50-3.49 is neutral, 3.50-4.49 is satisfied, and 4.50-5.00 is very satisfied.

3.1. Respondent characteristics

The survey respondents (SR) overview, Table 1, shows that little over half of SR were female (54%), which are over 50% of SR were under 25 years old and about 30% were between 25-44 years old. The personal income reported over 65% of SR made less than 10k baht per month and (59%) of SR were not holding any degree. Approximately over half of SR were employed, which belong to business and government sectors, but students made up 46% of those SR.

3.2. Access mode choice

Multiple transport services provided access to/from the railway station including individual transport as private. The survey results show the proportion of railway station access mode comparison between public and private transport. The mode choice behavior seems to be related with monthly income status as sown in Fig. 1. The SR who has lower than 15k baht per month preferred to use public transport 20% more than private, while those with 10k-15k baht per month preferred to use public transport 37% more than private. Moreover, the SR preferred private transport to access the railway station when income per month increases to more than 15k baht per month. The SR preferred to use private 43% more than public transport when the income is 15k-30k baht per month.

The public transport's user group in Table 2. reported over 38% of SR used "Song Teaw" (minibus style, occupied about 10-15 passengers, two rolls facing seat) to access the railway station, and the "Moto Taxi" (motorcycle-taxi, occupied a passenger) were (5.6%) used also. But others public service such as "Tuk Tuk" (motor-tricycle, occupied 2-3 passengers), van, and taxi has surprisingly low percentage of usage at only 5%. There are some SR who used non-motorized service "Sam Lor" (Tricycle with non-motorized, occupied 1-2 passengers) at less than 1% to access the railway station.

Table 1. Descriptive statistics.

Descriptions	*N*	%	Descriptions	*N*	%
Gender			*Income (baht)*		
Female	270	53.8	Less than 10000	330	65.7
Male	232	46.2	10000-15000	83	16.5
Age			15000-30000	68	13.5
Less than 25	270	53.8	30000-45000	14	2.8
25-34	88	17.5	More than 45000	7	1.4
35-44	64	12.7	*Employment status*		
45-54	36	7.2	Student, College	231	46.0
55-64	28	5.6	Employee	109	21.7
Over 64	16	3.2	Officer	71	14.1
Education			Self-employed	51	10.2
Graduate degree	13	2.6	Farmer	20	4.0
Bachelor's degree	193	38.4	Owner	15	3.0
Less than bachelor	296	59.0	Retired	5	1.0

Table 2. Transport mode access to railway station and trip purposes.

Descriptions	*N*	%
Transport Mode		
Sam Lor (Tricycle)	2	0.40
Taxi	11	2.19
Vans	12	2.39
Tuk Tuk	16	3.19
Moto taxi	28	5.58
Song Teaw	194	38.65
Private	239	47.61
Purpose		
Business trip	118	23.51
Non-business trip	384	76.49

3.3. Satisfaction measures

The satisfaction has been collected from SR, the satisfaction statement provided SR's feedback and experiences of riding, related individual satisfactions of transport mode service access to/from the railway station. The reliability test had been used for confirming all ten satisfaction questions were reliable as described in reliability perspective section above, resulting of Cronbach's alpha value was 0.89, which clarifies the satisfaction of the service provided by this study was reliable and acceptable. The satisfaction level by the mean value in Fig. 2 represents an overview of SR's feedback on ten satisfaction factors within the value of (3.26) to (3.44), which had been considered as a medium satisfaction level. But "ticket service" (3.44) and "travel cost" (3.42) were the most satisfied factors respectively. The field survey found all the available transport modes did not issue ticket for riding, as passengers can ride using only cash. The score of "travel cost" might reflect satisfaction feeling on riding cost as a reasonable price to the railway station. A cluster of time concern as "service schedule" (3.34), "travel time" (3.32), and "on-time reliability" (3.26), approached poor satisfaction level comparison among those ten factors respectively. The factor of "quality of service" and "accessibility" resulted in same satisfaction level at (3.38). Those SR considered "personal safety" (3.35) more than "cleanness" (3.34).

Nonetheless, Did the data indicate a difference in the true mean of satisfactions for the ten experimental factors? Test for a difference in the true mean of satisfactions using Friedman's test is an extension of the Wilcoxon nonparametric test alternative to the repeated-measures ANOVA by Motefakker (2016). It is usually used for measuring the same sample of subjects for the same variable on three or more occasions. They represent the value of demographic characteristics such as mean, standard deviation, etc. As the raw data had been ranked to carry out the test, the Friedman's test could also be used on data which had already ranked. Statistics table represents Friedman's test descriptive such as satisfaction factors, valid data, mean value, standard deviation and the maximum and minimum of satisfaction level of each question had presented. Friedman's test rank is shown in the last column, the highest score belongs to ticket service factor is 5.83. It aligned to mean score which was given the highest score in the same factor, see in Table 3. This means that ticket service factor was chosen as the most appropriated satisfaction factors for riding services to the railway station, according to the highest value both mean score and Friedman's test rank.

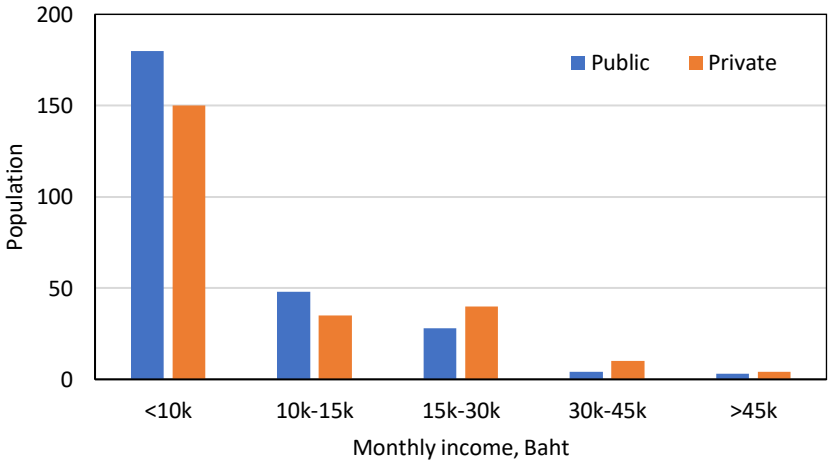

Fig. 1. Comparison of using public and private transport relate to monthly income.

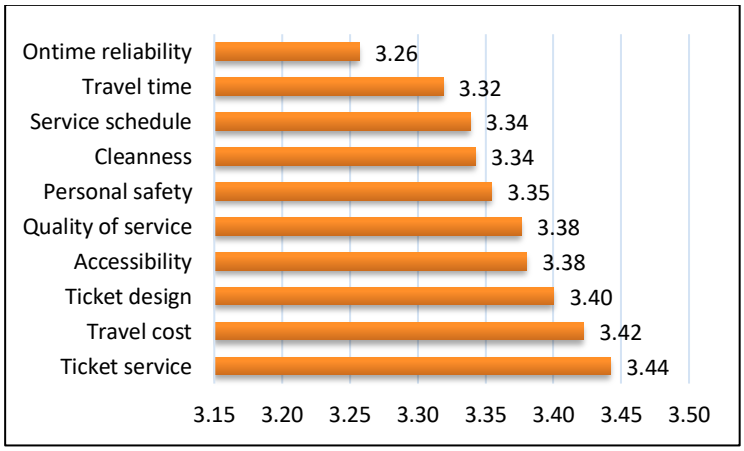

Fig. 2. The means score of satisfaction factors.

Table 3. The Friedman's test descriptive and rank.

Satisfaction factors	Descriptive Statistics					
	N	Mean	Std. Deviation	Minimum	Maximum	Friedman's test rank
Travel cost	502	3.42	0.718	1	5	5.69
Ontime reliability	502	3.26	0.689	1	5	5.05
Accessibility	502	3.38	0.740	1	5	5.54
Quality of service	502	3.38	0.768	1	5	5.54
Cleanness	502	3.34	0.888	1	5	5.44
Personal safety	502	3.35	0.810	1	5	5.51
Ticket design	502	3.40	0.774	1	5	5.66
Ticket service	502	3.44	0.771	1	5	5.83
Service schedule	502	3.34	0.780	1	5	5.37
Travel time	502	3.32	0.823	1	5	5.36

The Friedman's test statistics summary is represented in Table 4. The test statistics table informs the actual result of the Friedman's test, and whether there was an overall statistically significant difference between the mean ranks of related factors. It was carried out to compare the total understanding scores for the ten different factors as a non-parametric test. Apparently, there were significant differences between the factors since P-value test is less than the significance level $\alpha = 0.05$, which indicates the rejection of the null hypothesis to conclude that there is a difference in the true mean of each satisfaction factors.

Table 4. The Friedman's test statistics.

N	502
Chi-Square	38.982
df	9
Asymp. Sig.	.000

4. Results

4.1. The reliability analysis

The result of the reliability analysis was shown Cronbach's alpha value 0.89, which indicated the reliability of ten factors were credible and acceptable. This analysis was performed using IBM SPSS Statistics 23 to clarify. Those variables can be used in regression modeling steps and expected satisfaction results. These satisfaction factors were used as explanation of the individual perception on transport mode services access to the railway station in the next section. The consideration of reliability Cronbach's alpha value should be greater than 0.70 as acceptable internal consistency, the achieved Cronbach's alpha value of the questionnaire was higher than 0.70, the results as shows in Table 5 and 6.

4.2. The analysis of mode choices

The results of the binary logistic analysis for transport mode decision of the railway station accessibility is represented in Table 7. In this study, performed mode choice models by hierarchical regression technique (Chang, 2013), the analysis was controlled by participants information such as gender, age, income, education, car ownership, etc. In order to consider mode choice, dependent variable was targeted into those 0 as public, while 1 as private user. The attribute variables separated into tree major categories; *personal attribute*, *trip attribute*, and *satisfaction factors*. Mode choice models were done with three different models under 95 percent of confidence levels. As the first step, using the personal attribute as participants demographic information to perform model. The second step, the analysis included others significant variables of travel attribute and found the variables of transit, travel cost, and travel time effected on mode choice decision. The final step, all significant variables were added in the modeling process. Hence, the best model would be described by the highest pseudo R square value.

Model A had seen the smallest value of pseudo R square with a single attribute category of personal attribute added. Model B was a combination of personal attribute and trip attribute, the result showed a group of personal attributes is the most influencing to model. The third model obtained a highest pseudo R square reflects a simplified representation of reality. The performance of the model will be explained in the next section.

The personal attributes, the positive coefficient with "Gen", "Age3", and "Occ" significantly affect mode choice decision. Especially, group of "ages 35-44" had higher probability to use private than others (OR=2.25) when compared to gender and occupation attributes. The negative coefficient associated with "income3" and "income4" have presented the range of income, which significantly affected mode choice decision. A group of higher incomes "15k-30k baht a month" (OR=0.32) seen the probability of choosing public transport less than low income, with higher possibility to own and use the private vehicle.

Due to trip attribute, there were three influencing variables found in the last significant model. A number of connections "Transit" associated with a positive coefficient which had potential to choose to ride private (OR=1.80), a high number of transit

essentially affect the transport mode decisions, people was unlikely to split up their trip because of travel time would increase more than usual. Travel cost variables associated with a negative coefficient that "Tcost1; <= 20 baht" reflected the probability in choosing private when user consider traveling by low cost (OR=0.35) rather than "Tcost2". One possible reason was using public transport frequently meant spending more money, especially for transit procedure while private could perform a direct ride from their origin to the station. The travel time variable could influence on the mode choice. "Ttime3" (OR=3.37) shows high probability in choosing the private. This result may possibly be explained by travel time consideration, because public transport may took longer than private. Therefore, people chose private instead of public transportation when travel time had spanned.

All satisfaction variables have been tested but only significant factors will be considered and fit into the model. The first two models excluded the satisfaction factor regarding the hierarchical regression technique, the final model contained the significant factors. They associated with user's travelling perception when getting transport service to the station, "travel time" and "ticket design" had influenced to mode choice, but travel time satisfaction factor seemed consistent to reality and influence choosing private rather than the design of the ticket because of the travel time was the priority concern when planning a trip. On the other hand, these factors could be described as a possibility to choose private.

Table 5. The reliability analysis of the questionnaires.

Case processing summary		N	%
Cases	Valid	502	100.00
	Excluded[a]	0	0.0
	Total	502	100.00

[a] Listwise deletion based on all variables in the procedure.

Table 6. The reliability analysis of the satisfaction factors.

Cronbach's alpha	N of factors
0.890	10

Table 7. Results of the binary logistic regression analysis.

Variable	Model A		Model B		Model C	
	Coef.	OR	Coef.	OR	Coef.	OR
Personal attribute						
Gen	0.321*	1.378	0.430*	1.537	0.452*	1.572
Age3	0.714*	2.042	0.826*	2.285	0.809*	2.247
Occ	0.478*	1.613	0.567*	1.763	0.604**	1.830
Income3	-0.944**	0.389	-1.119**	0.327	-1.132**	0.322
Income4	-1.594*	0.203	-1.978**	0.138	-2.045**	0.129
Trip attribute						
Transit			1.874**	0.002	0.588**	1.801
Tcost1			.360**	0.001	-1.053**	0.349
Tcost2			.306**	0.005	-1.221**	0.295
Ttime2			1.529*	0.035	0.431*	1.538
Ttime3			3.127**	0.001	1.216**	3.374
Satisfaction factors						
Travel time					-0.343*	0.710
Ticket design					0.339*	1.403
Constant	1.249	3.486	1.238	3.448	1.279	3.592
Pseudo R^2	0.063		0.159		0.178	

* $p < 0.05$.
** $p < 0.01$.

4.3. Model performance

The binary logistic models were performed using 502 effective datasets from participants who travel to the railway station by a variety of transport modes. The prediction of transport modes access to the railway station was considered. Those scenarios of the binary logistic model showed the confidential value as pseudo R square, which explained higher values indicating better model fit. The comparison of model performance as shows in Table 8. is divided into hierarchy scenarios in the previous section, which compared between field and predicted data. The predicted data have been given by the model performing process. However, the percentage of model accuracy would be considered as a model performance. The first model represents the lowest perfection with a small accuracy value. It contains personal characteristic variables only. After including the others effective variables such as trip characteristics and satisfaction factors into modeling steps, the results showed an increase of accuracy rate.

In this study, the model A was considered as a low accurate model since the prediction result came up with under 50% accuracy on the private user, also the overall performance had lower than the others. The second model was integrated personal attribute with the trip attribute variables. The accuracy rate, and overall performance was greater than the previous model. The last, model C resulted in the highest level of reliable with 66% accuracy in overall performance. Its predicted both public transport user and

private car user was greater than 60% accuracy. Hence, the model C was considered as a highly accurate model which had reflect the influence of factors to the mode choice decision.

Table 8. Comparison of model performance.

Outcome	Model A		Model B		Model C	
	Public	Private	Public	Private	Public	Private
Field data	263	239	263	239	263	239
Predicted data	199	95	185	135	177	152
Accuracy %	75.7	39.7	70.3	56.5	67.3	63.6
Overall %	58.6		63.7		65.5	

4.4. Satisfaction factor analysis

Based on the indicators of satisfaction with the feeder services, all 10 factors that satisfied from the field survey have been analyzed, using *Factor Analysis* principles to group new factors that had highly correlated between factors, then came up with new satisfy components. It also made possible to focus on which factor argent to be improved according to priority. The analysis resulted in two rising components as shows in Table 9.

Comfort component; could be explained by seven indexes, including ticket service, ticket design, service schedule, travel time, personal safety, quality of service, and cleanness which reflected the service. It was also a large combination factors and important factors for public transportation services. Convenience component; could be explained by three indexes, including travel cost, on-time reliability, and accessibility respectively. The reliability of the service was extremely important, not less than the quality of service. Reliability directly affected service providers and users. For example, if the reliability of the service was reduced, it might influenced the decision of using the transport service or choose other alternatives. Meanwhile, the Kaiser-Meyer-Olkin (KMO) statistics used to measure the suitability of data in factor analysis procedure, it was found that the KMO = 0.913 statistic which has close to 1 statistic shows that the variables are related. Thus, factor analysis was considered appropriate for data analysis.

Table 9. Satisfaction factors categorization.

Satisfaction factors	Components	
	Comfort	Convenience
Ticket service	**0.795**	0.158
Ticket design	**0.783**	0.103
Service schedule	**0.687**	0.352
Travel time	**0.682**	0.325
Personal safety	**0.673**	0.264
Quality of service	**0.598**	0.390
Cleanness	**0.596**	0.351
Travel cost	0.146	**0.778**
Ontime reliability	0.260	**0.759**
Accessibility	0.356	**0.711**
Kaiser-Meyer-Olkin (KMO) = 0.913		

5. Conclusions and discussion

The primary objective of this research was to understand the railway station accessibility related to mode choice behavior extraction for improving the performance of a binary logistic regression model for transport mode choice decision. It was a case study of a specific area; Nakhon Ratchasima province in Thailand, for studying the potential to develop mode choice model using hierarchical regression technique combination reliability investigation, then demonstrated significant effects of influencing factors on access mode choice to the railway station. The results had shown the passion of using transport to access the railway station, reflected via satisfaction factors with neutral satisfaction level in overall performance. Operation reliability statements a weak point, especially time management may consider as a priority to reach trusty, which typically influences to mode choice decision. The city planner must consider the existing transport system performance because it is an urban transit backbone, regarding urban mobility and accessibility, this is a modern-day classic case. The binary logistic analysis obtained the hierarchical processing to perform mode choice models, integrated with perception variables, to predict accepted behavior of given transport modes. Accuracy rate appropriated when gathering a layer of a personal attribute, trip attribute, and satisfaction factors, results gained more accuracy.

Limitations of this study could overcome by using a complex solution such as multiple-choice modeling even involving data mining techniques to gain the model performances. Also, transit mode would have divided into multiple and represent the reality of the study area, for example, other access transport mode might be considered and contribute to mode choice prediction models. Modern field survey techniques will discuss in the future study.

Acknowledgments

This study was funded by a seed grant from the Institute of Research and Development of Rajamangala University of Technology Isan, Thailand (series 2017). The authors would like to thank all Logistics Technology program's staffs for their valued time throughout this study. Special thanks to Worapon Aree for excellent supported.

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