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Original Article

Factors affecting road users' satisfaction: the case of Motorway Route 7

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Abstract

This study proposes to evaluate and identify the significant factors affecting road users' satisfaction level. This study mainly focuses on investigating the related factors that may contribute to satisfaction level of all road users on Motorway Route 7. The questionnaires are developed and separated into three main sections, which are respondent profiles, measurement of the level of satisfaction toward each indicator, and the overall satisfaction of travelers on the Motorway Route 7. Several statistical techniques are proposed, such as exploratory factor analysis and multiple regression. Moreover, descriptive correlation analysis is conducted to show that the dependent variables contribute to the independent variable. The study has shown that the highway conditions are the most significant factor affecting road users' satisfaction. The completed result of this study is expected to serve as a guideline for highway authorities to improve their service ability level along Motorway Route 7.

Keywords: correlation analysis, motorway, multiple regression, road users' satisfaction level

1. Introduction

Land transportation is one of the most important ways of transportation as it covers most areas and modes. The Department of Highways (2012) revealed that over 51,600 kilometers of highways in Thailand are obligated by the Department of Highways, Thailand. Among all, highways can be divided into two main groups, national highways and intercity motorway with 51,323.789 km and 289.419 km in length, respectively. The Department of Highways is in charge of all highways in Thailand. It collaborates with overseas operations and academic administration and allows external agencies involved to comment on the relevance of highway use. In addition, the Inter City Motorway Division works along with the Department of Highways; it serves the motorway network to link together all regions and to follow highway standards and safety. It constructs, maintains, and develops highway and safety systems. The Inter City Motorway Division aims to improve satisfaction of users and to build competitive advantages (Inter City Motorway Division, 2012). Their objective is to provide good serviceability and convenient road networks to Thai people. Other than improving the infrastructure of the country's logistics systems, the Inter City Motorway Division has been trying to maximize the efficiencies of road networks in order to promote Thailand tourisms. With better road networks, it believes that visitors could gain access to many of Thailand's hidden attractions without much difficulties. In addition, the Department of Highways has an objective to accelerate the development of road construction, and motorway, to cover all regions. Furthermore, the department aims to develop highways to accommodate increased traffic and eliminate traffic congestion problems (Department of Highways, 2012).

Approaching the Association of South East Asian Nations (ASEAN), Thailand has planned to cope with logistics and transportation systems to support the economic growth of the ASEAN nations. In 2012, the total travelled distance on highways was 177,341,178,014 vehicle-kilometers, where 78,058,821,845 vehicle-kilometers of the total travelled

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distance on highways is the total freight transport. Furthermore, the annual average growth rate of travelling on highways during 2008 to 2012 was 5.4% (Department of Highways, 2012). Motorway Route 7 is known as the route that stretches from Bangkok to Chonburi and is connected to a variety of important landmarks, which are Suvarnabhumi Airport, Laemchabang Sea Port, and Pattaya City. Suvarnabhumi Airport was ranked as the 20th international airport in year 2010 for transport. Moreover, Laemchabang Sea Port, one of the major deep sea ports in Thailand, is significant to the commerce of the country (Office of Planning, Ministry of Transport, 2013). Pattaya City is a famous tourist attraction generating almost 87,000 million baht from tourists, which welcomed over 8 million tourists in 2012 (Amnatcharoenrit, 2013).

Motorways are roads that are designed to avoid city towns and are concerned with safety and traffic congestions by having full control of access with fences along the road, as certain types of vehicle such as motorcycles are prohibited to enter the motorway. They are constructed to support high speed traffic flow of 120 to 140 km/h without traffic lights and junctions. Road users have to pay toll fee of at least 30 Baht, and they do expect higher standard of serviceability level than travelling on a free public highway.

The Inter City Motorway Division receives a certain amount of annual budget to operate routine maintenance on roads and their assets along the roads. Those tasks are small deterioration fixing on road surfaces, shoulder maintenance, sidewalk maintenance, connection road, median, and drainage system and bridge maintenance. Like other government organizations, normally, the budgets that it received do not match with the budgets requested. Therefore, it has to come up with an effective way to utilize their limited and inadequate maintenance budget. One way to achieve the goal, the Inter City Motorway Division has to be able to identify which area that needs to be improved first through the study of road users' satisfaction.

The attitude assessment of road users has rarely been done on highway networks in Thailand. Road users' satisfaction on toll-fee motorways has never been done to identify the factors affecting the overall satisfaction while using a motorway. This may result of inaccurate development directions, and lead to the users' dissatisfaction and result in inappropriate used of annual maintenance budget. The result of this study is expected to assist the authorities to understand what road users think towards the road serviceability level, so they are able to respond to the needs of road users appropriately. In addition, this study has consisted of over 800 random samples of road users that stopped at the rest area of Motorway Route 7 (km49-51) on both in-bound and out-bound directions. Multiple Regression is used as statistical method to extract factors affecting road users' satisfaction. This study intends to use the obtained information as guideline for both short and long term strategic plans for the highway authorities. Suggestions and recommendations are also discussed in this study.

2. Literature Review

2.1 Expectations and satisfactions

To be successful in responding to customer needs is one of the keys to create a long-term customership for service providers. In this study road users are the customers who use and pay toll fee for using motorways, and highway authorities are the service providers who provide the roads service. Therefore, the customers should be able to set their expectation to the service providers, and they should response to make sure that it exceeds customers' expectation. This would lead to road users' satisfaction. Thus, it is important to understand the nature of road users' expectations in order to serve them at their highest satisfactions (Walker and Baker, 2000).

In addition, the study of Cardozo (1965) has stated that satisfaction is a level of customer approval when comparing a service's perceived performance with his or her expectations. It is based on information from all previous experiences with the service provider, and can be viewed as a function of all previous transactions. Satisfaction may be based on many transactions or just a few, depending on the number of times the road users have used a particular provider. In addition, services tend to be intangible, inseparable from their provider, and inconsistent in their delivery, so road users have a more difficult time to evaluate services (Jones and Suh, 2000).

Since satisfaction is one of the customer requirements to any entity, so we would to like to understand further on how we can identify the existing satisfaction level and which factors affecting road users' satisfaction on Motorway Route 7. In addition, the study of Roch and Poister (2006) stated that expectations and satisfaction in road maintenance could imitate happiness to stakeholder management. Thus, questions related to road conditions are included in this study.

2.2 Significant factors

Road users' satisfaction is affected by several significant factors; for instance, the value of time and money, convenience, and safety aspects. Based on (Himachal Pradesh Public Works Department, 2007), the respondents feel that parking facilities and public toilets are the most important issues that can affect their satisfaction. Another important factor was based on the type of road. The Road Users' Satisfaction Index (RUSI) score or the ranking of road usage's satisfaction from HPPWD (Himachal Pradesh Public Works Department) illustrated that the highest satisfaction level was on national highways, which was higher than for rural roads, because of better development on road infrastructure. Rural non-bituminous roads, such as Kachha Sadak, received the least satisfaction because it has narrow lanes, poor safety walls, and lack of travel amenities. Similarly, the study of Wardhana et al. (2011) reveals that road infra-

structure was a significant factor that affects satisfaction of road usage. For Japan, the users' satisfaction concluded that the purpose of traveling for short-distance purpose is shopping (58.4%) and the long-distance is business trips (40.7%).

The study of measuring Dutch car drivers' satisfaction with travel by Ettema *et al.* (2013) indicated the influential factors are socio-demographics, experience of road conditions, travel purpose, trip frequency, and driving habits. Increasing the capacity of congested roads causes fatigue and annoyance, which has an impact on travel satisfaction. In addition, design aspects, such as ease of way-finding and presence of buildings and billboards, can influence travel satisfaction. The tests of *Satisfaction with Travel Scale* (STS), Dutch (2013) mentioned that the design of highways significantly affects driver's satisfaction.

The Karnataka State Highway Improvement Project (2004) conducted a survey, asking respondents to indicate their extent of satisfaction for different attributes on the basis of a 5-point Likert Scale. As a result the average score of satisfaction was highest on quality of road surface and roadside signs, and there was least satisfaction on air and noise pollution. Some factors, such as damaged roads, lack of signs, potholes, and low quality of construction can affect dissatisfaction of road users. The UK Institution of Civil Engineers (2011) mentioned that UK roads are satisfactory for quality. A sharp rise in the number of pot holes caused by periods of extreme weather is expected to decrease satisfaction.

In Malaysia, Parasuraman *et al.* (1985) has shown that highway operators need to focus on the pavement conditions, especially on the safety of the roads by reducing obstructions, ensuring the roads are in good conditions, and road line markings are maintained accordingly.

In summary, expectation is a criterion that customer uses to evaluate service provider or service quality. Therefore, it is important to create a questionnaire in order to survey road users' satisfaction and to understand the road users' expectations. Moreover, good service and more satisfaction can retain and increase in the number of customers as road users.

Studies of road users' satisfaction on Motorway Route 7 have combined the concerned dimensions from the previous studies together with newly developed question sets that fit the characteristics of the Motorway Route 7. Multiple regression is the main method that is employed in this research. Past studies, reviewed in this research, have applied this method to successfully deliver significant factors affecting the overall satisfactions. Based on this study of the characteristics of Motorway Route 7 and previous research, there are following categories which comprise all items that affect road users' satisfaction as shown in Table 1, which are respondent profiles, value for time and money, comfort, safety, amenities, distance signs and road markers, and conditions. Respondent profiles are categorized in gender, age, vehicle-category, and respondent-category. Value of time and money is consisted of traveling time, fuel consumption, maintenance cost, and accessibility to settlement. Road width, road infrastructure, congestion are the components of comfort. Safety consists of feeling safe, safety designs, accident management, police posts, and emergency phones. Amenities are comprised of public toilets/bathrooms, foods/drink, drinking water, medical facilities, rain shelter/bus stops,

Table 1. The Comparison of Main Factors between research papers

Main Factors	Road User Satisfaction Survey in the State of Himachal Pradesh.	Consideration of Road Management from the View Points of Long- and Short-Distance Road User's Satisfaction	The road to happiness: Measuring Dutch car drivers' satisfaction with travel	Second Road User Satisfaction Survey in Karnataka	Road satisfaction continues to go downhill	Customer satisfaction and service quality in Malaysian highway	Road users' satisfaction Survey on Motorway Route 7
1 Respondent Profiles	✓	✓	✓	✓		✓	✓
2 Value for Time & Money	✓	✓					✓
3 Comfort	✓	✓	✓	✓	✓	✓	✓
4 Safety	✓	✓	✓	✓	✓	✓	✓
5 Amenities	✓			✓			✓
6 Distance Sign and Road Markers	✓	✓				✓	✓
7 Conditions			✓	✓			✓

mechanics availability, and parking facilities. Distance signs and road markers include adequacy and visibilities. Conditions consist of behavior of other drivers and the characteristics of Motorway Route 7. Overall is the last factor for evaluating the overall satisfaction.

The Inter City Motorway Division (2012) cited that the vision of Motorway Route 7 is to focus on road users' satisfaction and to be an important part of supporting logistics for making economic security Thailand, and to advance towards the top of the Association of South East Asian Nations (*ASEAN*).

3. Methodology

3.1 Method of approach and data collection

The study has employed two research methods. First, it is documentary research from journal articles and case-studies related to road users' satisfaction. The second method is a survey study by distributing questionnaires to collect data, asking respondents to indicate their satisfaction level on each of the items related to motorway. The questions are answered based on a 5-point Likert Scale ranging from "*most satisfied*" to "*most dissatisfied*". A summary of each item is shown in Table 2. Questionnaires are randomly distributed to road users who have travelled on Motorway Route 7 on both in-bound and out-bound directions. Data were collected from October 19, 2013 until December 18, 2013. In addition, the survey focused on respondents who were either drivers or passengers of at least 18 years in age.

3.2 Analysis of factors affecting the satisfactions

In this study, factor analysis is used to reduce the dimensions of related independent variables. This technique has three main uses: (1) to understand the structure of a set of variables, (2) to construct a questionnaire to measure an underlying variable, and (3) to reduce a data set to a more manageable size while retaining as much of the original information as possible (Field, 2009).

After that, multiple regression is employed to predict the outcome of factor affecting road users' satisfaction level; the correctness of prediction has been proved from variety methods. According to Field (2009), regression analysis enables us to predict future based on values of predictive variables. It is also an efficient means of gathering data without introducing threats to reliability that can occur with other data collection means. Generally, if the variance inflation factor (VIF) values < 5 for a particular independent variable, multicollinearity is not considered a problem for that variable. VIF values $\geq$ 5 implies that the correlation between the independent variables is too extreme and should be dealt with by dropping variables from the models (Groebner *et al.*, 2011). The level of significance is set at $p < 0.05$, as that is the customary level used when working on significance (Krathwohl, 2010). The correlation coefficient squared (R^2) is a measure of the amount of variability in one variable that is shared by the others. The adjusted R^2 value indicates the loss of predictive power, which tells us how much variance in independent variable would be accounted for if the model had been derived from the population from

Table 2. Examples of the Questionnaire.

Staff only **Date (dd/mm/yy):**……/……/……

Time: ❒ 7.01-9.00 am ❒ 9.01-11.00 am
❒ 11.01 am - 1.00 pm ❒ 1.01-3.00 pm
❒ 3.01-5.00 pm ❒ 5.01-7.00 pm

Direction: ❒ In bound (Travel to Bangkok)
❒ Out bound (Travel to Chonburi)

Road User's Satisfaction Survey Motorway Route 7

Section 1 Please mark ✓ in ❒ for information that is true to you (Please select only one)

Gender:
❒ Male ❒ Female

Age:
❒ 18 - 27 years ❒ 28 - 37 years ❒ 38 - 47 years
❒ 48 - 57 years ❒ 58 years or above

Education Level:
❒ High school or Vocational certificate ❒ Associate's Degree or Vocational Diploma
❒ Bachelor's Degree ❒ Master's Degree ❒ Above Master's Degree

Occupation:
❒ Student ❒ Teacher/Professor ❒ Government officer
❒ State enterprise employee ❒ Office worker ❒ House husband/ Housewife
❒ Driver ❒ Private Business ❒ Other (please specify)……

Table 2. Continued

The Average Income per Month:

❒ Less than 20,000 Baht ❒ 20,001 - 50,000 Baht ❒ 50,001 - 100,000 Baht
❒ 100,001 - 200,000 Baht ❒ Over 200,001 Baht

Type of Your Vehicle:

❒ Private car ❒ Cab (taxi, van, bus) ❒ Commercial vehicle (Pickup truck)
❒ Six-wheeled truck ❒ Heavy truck (10 wheels or more)

The Average Distance You Travel per Year:

❒ Less than 20,000 km. ❒ 20,001 - 40,000 km. ❒ 40,001 - 70,000 km.
❒ 70,001 - 100,000 km. ❒ Over 100,001 km.

The Frequency of Traveling via Motorway Route 7:

❒ Everyday ❒ 1 time/week ❒ 2-3times/week
❒ 4-6 times/week ❒ 1 time/month ❒ Less than 1 time/month

The Reasons of Traveling via Motorway Route 7: (May select more than one)

❒ To return to hometown ❒ Holidays ❒ Transaction/Transportation
❒ To study ❒ To work ❒ Suitability of fees paid
❒ The convenience of traveling ❒ To save time for travel
❒ Other (please specify)……

Section 2 Please mark ✓ in the "box" of your satisfaction level (Please select only one)

Identify the level of satisfaction of the following items	Very Satisfied	Satisfied	Neither satisfied nor dissatisfied	Unsatisfied	Very unsatisfied	N/A
1. Value for Time and Money						
1.1 The speed and accuracy in the collection of the toll fees by highway officers						
1.2 Traveled time that is saved when using this road						
1.3 The fuel consumption rate when using this road						
1.4 The amount of toll fees paid when using this road						
2. Comfort of travel						
2.1 The number of the collection of the toll fees in each tollgate						
2.2 The smoothness of the road surface						
2.3 The number of lanes for this road						
2.4 The width of each lane of this road						
2.5 The location of each interchange that be able to connect to the destination						
3. Safety						
3.1 The speed in managing the accidental area by officers						
3.2 The speed of emergency responses by officers						
3.3 Controlling in freight transportation of transportation vehicles						
3.4 The safety equipment of this road which are rail way, fences, and guard rails						
3.5 The lighting that assists drivers at night						

Table 2. Continued

Identify the level of satisfaction of the following items	Very Satisfied	Satisfied	Neither satisfied nor dissatisfied	Unsatisfied	Very unsatisfied	N/A
4. Amenities						
4.1 The number of public toilets						
4.2 The cleanness of public toilets						
4.3 The convenience of reaching to the service area/fuel stations						
4.4 The safety while spending time at car park of service area likes no theft						
5. Signs/traffic/warning and the road markers						
5.1 The number of traffic signs that is facilitated when using this road						
5.2 The accuracy and clarity of traffic signs that is facilitated when using this road such as guideposts and road sign						
5.3 The number of emergency telephone number signs						
5.4 The warning signs when the lane are closed likes diversion signs						
5.5 The visibility of road mark						
6. Conditions						
6.1 The traffic volume on this road						
6.2 The cleanliness of road surface and the surrounding area						
6.3 The characteristics of the Motorway Route 7 such as fences, no traffic lights and no vehicle of less than 4-wheels						
6.4 The behavior of other drivers						

Section 3 Please mark ✓ in ❒ for information that is true to you (Please select only one)

Your overall satisfaction when using this Motorway Route 7

❒ Very Satisfied ❒ Satisfied ❒ Neutral

❒ Dissatisfied ❒ Very Dissatisfied

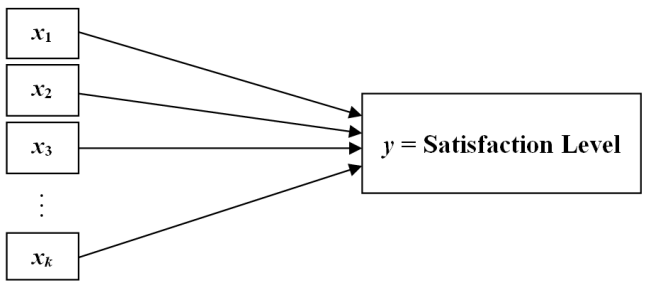
Will you travel on this Motorway Route 7 again?

❒ Yes ❒ No, I will take other routes.

Will you recommend your friends/family to use Motorway Route 7?

❒ Yes ❒ No

which the sample was taken (Field, 2009). In addition, the study analyzed data from the examination of predictive variables and the dependent variable. The analysis model of factors affecting road users' satisfaction is described in Figure 1.



Where, k = Number of factors or independent variables

Figure 1. Analysis model of factors affecting road users' satisfaction.

4. Results

4.1 Sample characteristics

Total samples that were collected are 1,331 samples. These samples consist of 890 useful samples and 441 non-useful samples. The reason that determined that samples are useful is that questionnaires have all questions answered.

The duration of collecting the data is 20 days. The 890 useful samples can be classified into ten determinants as indicated in Table 3. The information is summarized as following, the period of traveling time determinant indicates that 31.80% of the respondents traveled regularly via this motorway during 9.01-11.00 a.m. The majority of the respondents (74.83%) traveled from Bangkok to Chonburi more than from Chonburi to Bangkok (25.17%). On the age determinant respondent's age is between 18 to 27 years old (37.19%) and usually travels via this motorway. On the type of vehicle term, the majority of the respondents always use their private car for traveling (56.29%). Lastly, most of the respondents traveling via this route often travel one time per month (28.76%).

4.2 Factor analysis

Prior to multiple regression analysis, the Principal Component Analysis was conducted from 27 determinants with orthogonal rotation (varimax) in order to identify the structure of determinants related to road user satisfaction. The value of Kaiser-Meyer-Olkin (KMO) value is 0.948 out of 1, this indicates that samples are appropriate to proceed on

Table 3. Respondent profiles (demographics).

Determinant	Motorway Route 7 users	
	Total (n = 890)	Percentage (%)
Period of Traveling Time		
7:01-9:00 am	62	6.97
9:01-11:00 am	283	31.80
11:01am-1:00 pm	220	24.72
1:01-3:00 pm	185	20.79
3:01-5:00 pm	121	13.60
5.01-7.00 pm	19	2.13
Direction		
In Bound	224	25.17
Out Bound	666	74.83
Gender		
Male	449	50.45
Female	441	49.55
Age		
18 - 27 years	331	37.19
28 - 37 years	302	33.93
38 - 47 years	152	17.08
48 - 57 years	79	8.88
58 years or above	26	2.92
Education Level		
High school or Vocational certificate	197	22.13
Associate's Degree or Vocational Diploma	153	17.19
Bachelor's Degree	464	52.13
Master's Degree	66	7.42
Above Master's Degree	10	1.12
Occupation		
Student	201	22.58
Teacher/Professor	45	5.06
Government officer	52	5.84
State enterprise employee	50	5.62
Office worker	333	37.42
House husband/Housewife	37	4.16
Driver	48	5.39
Private Business	110	12.36
Other	14	1.57

Table 3. Continued

Determinant	Motorway Route 7 users	
	Total (n = 890)	Percentage (%)
Average Income per Month		
Less than 20,000 Baht	541	60.79
20,001 - 50,000 Baht	280	31.46
50,001 - 100,000 Baht	46	5.17
100,001 - 200,000 Baht	14	1.57
Over 200,001 Baht	9	1.01
Type of Vehicle		
Private car	501	56.29
Cab (taxi, van, coach bus)	289	32.47
Commercial vehicle (Pickup truck)	74	8.31
Six-wheeled truck	18	2.02
Heavy truck (10 wheels or more)	8	0.90
Average Distance Travelled per Year		
Less than 20,000 km.	430	48.31
20,001 - 40,000 km.	306	34.38
40,001 - 70,000 km.	80	8.99
70,001 - 100,000 km.	56	6.29
Over 100,001 km.	18	2.02
Frequency of Traveling via Motorway Route 7		
Everyday	92	10.34
1 time/week	98	11.01
2-3times/week	155	17.42
4-6 times/week	70	7.87
1 time/month	256	28.76
Less than 1 time/month	219	24.61

factor analysis. On the Bartlett's test of Sphericity, the approximation of Chi-square and the significance is 13,704.147 from 351 *df*, and 0.000, respectively. These indicated that correlations between items are sufficiently large for a Principal Component Analysis (PCA). The likelihood increases that the null hypothesis can be rejected and the alternative hypothesis accepted and the variables are related. In addition, the Cronbach's Alpha coefficients of all factor dimensions were higher than 0.80. In accordance to Field (2009), the generally accepted range of the Cronbach's Alpha from 0.80 is appropriate for cognitive tests. The result from factor analysis is summarized as the following: the first factor is *distance signs and road markers*, consisted of number of traffic signs, accuracy and clarity of traffic signs, number of emergency telephone number signs, warning signs when the lanes are closed, and visibility of road markers. The second factor is *convenience*, consisted of number of tollgates, smoothness of road surface, number of lanes, lane width, and location of each interchange. The third factor is of *amenities*, consisted of number of public toilets, cleanliness of public toilets, convenience to service area, and safety in service area. The fourth factor is related to *value of time and money*. The fifth factor is related to *road conditions*, and the sixth is related to *speed of safety staff*. Finally, the seventh factor is related to *safety equipment and environment,* which included controlling of transportation vehicles, safety equipment, and lighting at night.

4.3 Multiple regression analysis

Out of seven independent variables, six of them are significantly affecting road users' satisfaction. They are *distance signs and road markers*, *convenience*, *amenities*, *value of time and money*, *conditions* and *safety*. According to Krathwohl's, about the customary level used when working on significance, the level of significance is to set at $p<$ 0.05. *Conditions* factor appeared to be the most important factor with 0.253, the highest number of standardized coefficient value followed by *distance signs and road markers* (0.173), *convenience* (0.172), *valuation for time and money* (0.137), *safety* (0.085) and *amenities* (0.082). However, speed of safety staff, is not a significant factor affecting the over

Table 4. Results of factor analysis.

Factors[a]	Mean	SD	Factor Loading	Variance Explained (%)
FACTOR 1: Signs/traffic/warning and road marking (0.886)[b]				13.060
Number of traffic signs	3.357	0.778	0.694	
Accuracy and clarity of traffic signs	3.395	0.779	0.720	
Number of emergency telephone number signs	3.228	0.804	0.730	
Warning signs when the lanes are closed	3.254	0.835	0.731	
Visibility of road markers	3.281	0.832	0.637	
FACTOR 2: Convenience (0.887)[b]				12.531
Number of tollgates	3.337	0.847	0.650	
Smoothness of road surface	3.303	0.894	0.598	
Number of lanes	3.426	0.849	0.734	
Lane width	3.477	0.812	0.726	
Location of each interchange	3.319	0.806	0.566	
FACTOR 3: Amenities (0.894)[b]				10.636
Number of public toilets	2.890	0.998	0.702	
Cleanliness of public toilets	2.603	1.030	0.830	
Convenience to service area	2.963	0.988	0.737	
Safety in service area	3.103	0.910	0.615	
FACTOR 4: Value for Time & Money (0.893)[b]				10.576
Speed and accuracy of highway officers	3.452	0.729	0.707	
Traveled time	3.571	0.754	0.717	
Fuel consumption	3.416	0.777	0.673	
Amount of toll fees	3.243	0.806	0.723	
FACTOR 5: Conditions (0.891)[b]				9.909
Traffic volume	3.182	0.811	0.798	
Cleanliness of road surface	3.360	0.846	0.686	
Characteristics of Motorway Route 7	3.486	0.865	0.562	
Legality of other drivers	3.191	0.813	0.685	
FACTOR 6: Speed of Safety Staff (0.898)[b]				7.355
Speed limit management	3.222	0.760	0.778	
Speed of emergency responses	3.236	0.763	0.771	
FACTOR 7: Safety Equipment & Environment (0.885)[b]				6.237
Controlling of transportation vehicles	3.164	0.861	0.511	
Safety equipment	3.441	0.834	0.526	
Light at night	3.252	0.871	0.639	
Total Variance Explained				70.323

[a] Principal component factors with iterations: Varimax rotation.
[b] Reliability score (Cronbach's α) for each factor grouping is shown in parentheses.

road users' satisfaction of Motorway Route 7 since the significance value is 0.087 which is greater than 0.05 can be concluded that the effect was too small to be detected. The overall regression results 75.30% of adjusted R square and 75.5% of R^2 of the variance are almost equal. Hence, this is a model of 'no relationship' at all between the variables (Fiels, 2009). The Durbin-Watson statistics was at the value of 1.767, which lies between the range of 1.5 and 2.5; this means the residuals are uncorrelated (Field, 2009). Groebner *et al.* (2011) stated that if VIF values lower than 5 for a particular independent variable, multicollinearity is not considered a problem for that variable. In addition, tolerance below 0.2 indicates a potential problem (Menard, 1995; Field, 2009). From the studied, the VIF values are all below 5 and the tolerance statistics all above 0.2. Hence, we can conclude that there is no collinearity within our data.

5. Discussion and Conclusions

This study empirically investigated road users' satisfaction on Motorway Route 7 by using of at least 800 samples of questionnaire in order to survey road users' satisfaction

Table 5. Collinearity statistics and regression results of factors affecting Motorway Route 7 users' satisfaction.

FACTOR	Motorway Route 7 users' satisfaction (n=890)			Collinearity Statistics	
	Unstandardized coefficient	Standardized Coefficient	t	Tolerance	VIF
FACTOR 1: Signs/traffic/warning and road markers	0.173	0.192	7.221***	0.409	2.445
FACTOR 2: Convenience	0.172	0.191	7.077***	0.398	2.51
FACTOR 3: Amenities	0.082	0.114	4.614***	0.475	2.103
FACTOR 4: Value for Time & Money	0.137	0.145	5.908***	0.48	2.081
FACTOR 5: Conditions	0.253	0.285	11.417***	0.465	2.152
FACTOR 6: Speed of Safety Staff	0.034	0.04	1.715*	0.545	1.835
FACTOR 7: Safety Equipment & Environment	0.085	0.097	3.624***	0.404	2.475
		Adjusted R Square = 0.753			
		Durbin-Watson = 1.767			
			F = 373.355***		

* p<0.10, **p<0.05, and ***p<0.01

and understand road users' expectation to fulfill the road users' expectation and reach the road users' satisfaction on Motorway Route 7. As the multiple regression results suggested, the significant factors that most affected road users' satisfaction were *conditions* which are traffic volume, cleanliness of road surface, characteristics of the Motorway Route 7, and legality of other drivers. The second most significant factor that affected road users' satisfaction was *signs/traffic/warning and road marking*. *Convenience* is the third that affected to road users' satisfaction, followed by value for time and money, amenities, safety equipment and environment, and speed of safety staff.

The study revealed that safety equipment and environment factors are concerns to road users. In accordance with the concerns; the Department of Highways strategic plan for 2012-2016 has stated seven stratagems to raise the highway standard. One of the stratagems is the development of highway infrastructure to support the growth in regional transportation under the purpose of traffic controlling by enforcing the Road Traffic Act (1979) and Highway Act (1992). Another stratagem is the development of highway infrastructure to meet the safety standards, also corresponds to this. Moreover, there are seven stratagems, which are aimed to update the accident information on the highway, to publicize traffic information and news to the road users, to establish and develop service centers, to prevent the accident on holidays by facilitating traffics and safety, to set up and repair safety equipment at the standards of safety, to enforce of using law rigidly for more efficiency, to control and manage the traffic for more safety while constructing the road, and to improve the risks or placement of roads (Department of Highways, 2012). This strategic plan also aims to increase the number of Motorway Route 7 users.

Conforming to value for time and money factor, the Intercity Motorway Route 7 had a closed experimental motorway tollgate system for the road users to collect smart cards from the staff at the beginning and return it and pay fees at the last tollgate. This closed system will be a fair system with the concept of more distance, more fees. This system also helps to release vehicles at the beginning tollgate. Thus, the fees will develop this route and others at the safety standards and efficiency to fulfill road users' satisfaction and to support the logistic system for building up the economic stability of the country.

6. Recommendations

Currently, there are several projects and action plans of the Intercity Motorway Division which are related to the development of highway infrastructure to support logistics of regional transport and a closed motorway tollgate system to solve the problem of safety and expensive toll fees. These projects are supported by the government through the Department of Highways. Based on this study, these projects should include routine maintenance management in order to keep the road conditions such as surface roughness at the acceptable standard; Emphasis should be place on projects that are aimed to solve the problems of indistinctness of signs, traffic, and warnings to increase safety while using the motorway. Additionally, repairing of the road surface is also important for higher convenience and decreasing travel time of the road users. According to the large amount of the vehicles that travel via this road, "easy pass" has already been implementing by the highway authorities to improve traffic flow and decrease traffic problems.

This current study could be continued in several directions in order to understand more about Motorway Route 7 users' satisfaction; for instance, the emotions of road users. It will allow us to have a better understanding about the impact of road user satisfaction. In order to

continue this study, surveying in different spans of time and place may gain more information and details from Motorway Route 7 users. In the future, this could be a model of road users' satisfaction on other roads. However, traditional respondents avoid doing survey questionnaires due to a limited time. Hence, the researchers need a strategy to reach more respondents; for instance, competing for a prize or reward, and distributing the survey questionnaires via a social network, which might generate more questionnaires.

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