Exploring behavioral intentions in new urban areas of motorcycle-dependent cities

Le Quan HOANG[1] and Toshiyuki OKAMURA[2]

[1] Graduate Student, Graduate School of Regional Development Studies, Toyo University
(28-20, Hakusan 5, Bunkyo-ku, Tokyo 112-8606, Japan)
E-mail: hoanglequan@gmail.com
[2]Member of JSCE, Graduate School of Regional Development Studies, Toyo University
(28-20, Hakusan 5, Bunkyo-ku, Tokyo 112-8606, Japan)
E-mail: okamura@toyo.jp

   Many Asian megacities are experiencing not only the high growth of car ownership and usage but also a similar trend for motorcycle. Therefore, it raises the question about future motorcycle use in new urban context different from the conditions of motorcycle use popularity. How people perceive local urban transport might influence on behavioral intentions. This study aims to explore behavioral intentions with regarding to urban developments and new transit alternatives in motorcycle dependent cities. Ho Chi Minh City (Vietnam) is selected as representative of developing-country megacities for this research.

1. INTRODUCTION

(1) Background

Motorization is accelerating in many metropolitans of developing countries. It is characterized by not only the growth of car ownership and usage but also the similar trend for motorcycle in emerging economies. Motorcycle becomes an important aspect of motorization, particularly in Asia. In last decades, the process of urban expansion results in significant changes in transportation patterns including the demand for long-distance travel and car use. Transit alternatives such as mass rapid transit (MRT) and bus rapid transit (BRT) have been introduced for improving service quality of public transport and tackling traffic congestion in city center. This process results in new land use patterns such as car–oriented suburbs and Transit Oriented Development area. The changing context challenges motorcycle mobility in some developing-country megacities.

Previous studies on motorcycle use have been conducted in both developed and developing countries such as Taiwan, Thailand, and Indonesia. It is found that the broader literatures focus in the regions different from the case in which motorcycle becomes a dominant mode in urban transport. In order to fill this gap, this study aims to explore behavioral intentions with regarding to urban developments and new transit alternatives in motorcycle dependent cities. Ho Chi Minh City (Vietnam) is selected as representative of developing-country megacities for this research.

In developing-country megacities, urban transport problems are described by particular characteristics such as premature congestion, deteriorating environment, high concern in safety and security, low affordability for the poor (Gwilliam, 2003). Therefore, traffic condition of developing nations is more chaotic than that of developed countries (Van, 2011). The differences are found not only in vehicle performances and public transport systems but also in people' travel behaviors relating to driving and law enforcement. The unique contexts with regards to urban transport are reflected by social orderliness attitudinal-aspects of car and public transport (Choocharukul et al, 2006; Van and Fuji, 2011). Although people's travel behaviors are related to attitudinal image variables for cars and public transport, the levels of variables' impacts vary

across different urban transport contexts such as Thailand and Japan (Choocharukul et al, 2006). It is argued that a new situation of urban transport, which is different from chaotic situation, might result in significant changes in travel behaviors. How is future motorcycle use in new urban contexts different from the conditions of motorcycle use popularity? How people perceive local urban transport might influence on behavioral intentions.

Within the transport literatures, the factors that make people more or less likely to use motorcycle are classified in socio-demographics, travel attributes, contexts. Previous studies discuss little about psychological determinants of motorcycle use. In exploring mode choice behavior in Taiwan-a motorcycle dependent region, Chen and Lai (2011) found that intention and habit have more significant effects on motorcycle use than socio-economic factors. Moreover, person norm toward environmental friendly is found to be determinants for the usage of private vehicle (automobile and motorcycle) under the fuel price rise (Chang and Lai, 2013). While motorcycle is used as an effective solution for the area overwhelmed by traffic congestion, it is also regarded as unsafe mode due to high traffic accident related to motorcycle ride in developing countries (Tsao, 2010; Esmael, 2013). Besides perceived urban transport mentioned above, therefore, traffic awareness determinants related to safety and congestion should be consider as new psychological variables in this research.

(2) Characteristic of study area

Located in the southern part of Viet Nam, HCMC has an area of 2,095 km^2 and includes 19 urban districts and 5 rural districts. The total population of HCMC is over 9 million that is expected to grow to 13.8 million by 2025 (Ministry of Transportation, 2013). By May 2012, the number of private vehicles in HCMC is 5.6 million including 503,952 cars and 5,145,516 motorcycles (Department of Transportation, 2014). Public transport system has only bus and taxi while mass rapid transits are being implemented. In 2009, it is estimated that public transport usage accounts for only 7.2 % of travel need while this figure is 5.4% for bus transport. Currently, the first two MRT routes, namely MRT 1 and MRT 2, have been launched in HCMC. Their construction will be finished in 2019 and 2020 respectively.

When the economy of Vietnam transferred to market oriented in 1986, urban development in HCMC has progressed rapidly. The increase in urban population associated with economic growth and motorization has led to an expansion of urban areas. Urban growth was mainly attributed to residential projects and industrial facilities sprouting in the areas. Residential development has emerged rapidly in two last decades. This process can be classified as: (1) spontaneous residential projects by small private developers; (2) residential projects by private domestic developers; and (3) large scale urban development by professional developers. In last decades, most of urban developments have been largely in the peripheries of the existing built-up areas and toward the northeast, northwest and north of the city along the existing primary roads (JICA, 2004).

2. METHODOLOGY

(1) Sampling and survey

The survey was carried out in November and December, 2014. Survey sites are mainly located in specific wards of district 2 (Thao Dien, Binh An, and An Phu), Ho Chi Minh City, Vietnam. Used to be suburban area, district 2 was urbanized rapidly in last two decades. There are many residential developments in survey site. Most of projects have been not finished yet while some developments are still under construction.

The surveys were conducted mainly at residential households where household representatives accept interviews. The priority time is evening for weekdays or day time for weekend. Extra questionnaire sheets were also collected at public places such as local councils, supermarket, schools, and universities where there are many local residents visiting every day. All questionnaire sheets were finished by face to face interviews. After removing incomplete responses from the initial questionnaires (N=230), 215 usable samples were obtained for further analysis.

Table 1 Sample characteristics

Category	Description
Gender	Male (60%), Female (40%)
Age group	<22 (7%), 23-30 (36%), 30-40 (40%), >40 (18%),
Household income (mil. VND) [*]	< 10 (8%), 10-20 (44%), >20 (47%)
Vehicle ownership	Motorcycle (98.6%), Passenger car (19%), Bicycle (46%)
Commuting mode	Motorcycle (89%), Car (5%), Bus (2%)

* 10,000 VND ≈ 0. 5 USD (2015)

(2) Measures

Socio-demographics

The survey contained a list of socio-demographic variables that may help to explain travel behavior. Individual information includes gender, age, occupation, and driving license. Household information on monthly income, size, residence type, and vehicle ownership were also required.

Travel patterns

The survey measured travel data including commuting modes, mode use frequency, commuting duration, commuting trip length, and travel expense.

Perceived Urban Transport

Respondents were asked to indicate how respondent perceive traffic condition, traffic safety, driving behavior, and traffic law enforcement in city center and in local neighborhood. Degrees of responses were formatted in five-point Likert-type using Semantic Differential Method (see Table 2). For example, the question "How comfortable do you feel about traffic condition in city?" was raised and respondents evaluate traffic condition by choosing scales from 1("Uncomfortable") to 5("Comfortable"). Details of perceived urban transport items are found in Appendix A.

Traffic awareness and behavioral intention

Attitudinal items regarding safety preferences, traffic concerns, and behavioral intentions such as bus ridership, MRT use, motorcycle use, and car use were measured in four-point Likert type format from 1("Strongly disagree") to 4("Strongly agree"). The reason for no neutral scales is to limit lexicographic behaviors of participants. Details of traffic awareness items are found in Appendix B.

Preferences in Park and Ride trips

Respondents were asked about their responses on different scenarios relating to purpose, distance, duration, working time, frequency, parking, and traffic were measured in four-point Likert type format from 1("Strongly disagree") to 4("Strongly agree"). In addition, trade-off alternatives related to time and cost were suggested to grasp the choices of Park and Ride Trip in five-point Likert-type from 1(Private vehicle use) to 5(Park and Ride use). Details of Park and Ride items are found in Appendix C.

Table 2 Content of perceived urban transport

Items	Evaluation scale (1-5)
Q1-Q5	Uncomfortable- Comfortable
Q2-Q6	Risky- Safe
Q3-Q7	Egotistic-Altruistic
Q4-Q8	Violently- Seriously

3. ANALYSIS AND COMPARISON

(1) Factor analysis

Factor analyses were conducted for identifying primary components of perceived urban transport and traffic awareness (see Table 3). Only attitude items having factor loading >=0.5 are noted. As a results, some factors were identified, namely as Perceived central urban transport, Perceived local urban transport, Motorcycle use awareness, Car use awareness, Bus safety belief, and Congestion concern.

Factor score are calculated by regression method and are normalized to set the neutral position at zero. These values were quartiled for further comparisons (see Table 4).

Table 3 Items' mean score and factor loadings

Factor	Item	Mean	Factor loading
Perceived central urban transport (F1)	Q1	2.43	.791
	Q2	2.49	.800
	Q3	2.61	.822
	Q4	2.73	.641
Perceived local urban transport (F2)	Q5	3.42	.763
	Q6	3.15	.854
	Q7	3.13	.864
	Q8	2.95	.778
Motorcycle use awareness (F3)	Q9	3.13	.632
	Q10	2.65	.539
	Q11	2.92	.780
Car use concern (F4)	Q12	2.88	.665
	Q13	2.78	.781
	Q14	3.29	.620
Bus safety belief (F5)	Q15	2.75	.762
	Q16	2.80	.834
	Q17	2.99	.713
Congestion concern (F6)	Q18	2.76	.647
	Q19	3.23	.711
	Q20	3.00	.741

Table 4 Value limitations and percentiles of factor scores normalized

	F1	F2	F1	F2	F3	F4
Min	-2.12	-2.65	-3.68	-2.87	-2.91	-3.44
Max	2.43	1.96	2.39	2.33	2.11	2.58
Percentiles						
25	-0.75	-0.53	-0.76	-0.67	-0.71	-0.71
50	-0.03	0.08	0.01	0.08	0.05	0.10
75	0.61	0.69	0.67	0.65	0.76	0.68

(2) Comparisons
a)Relationship between perceived urban transport and traffic awareness

Table 5 shows Pearson correlation efficient among perceived urban transport and traffic awareness factors. It is found that perceived urban transport has no relationship with motorcycle use awareness and car use concern. The more people perceive urban transport negatively, the more they have congestion concern, particularly in city center. In addition, people believe more in bus safety if they perceive central urban transport negatively.

Table 5 Pearson Correlation efficient

	F3	F4	F5	F6
F1	-.114	-.103	-.174[*]	-.303[**]
F2	-.079	.028	-.045	-.266[**]

*. Significant at the 0.05 level (2-tailed)
**. Significant at the 0.01 level (2-tailed)

b)Relationship between perceived urban transport and behavioral intentions

Figure 1a and 1b show the average scores of statements on behavioral intentions by quartiles of perceived urban transport. It can be found that there are no associations between perceived urban transport and the intentions of bus ridership, MRT use, motorcycle use, and car use.
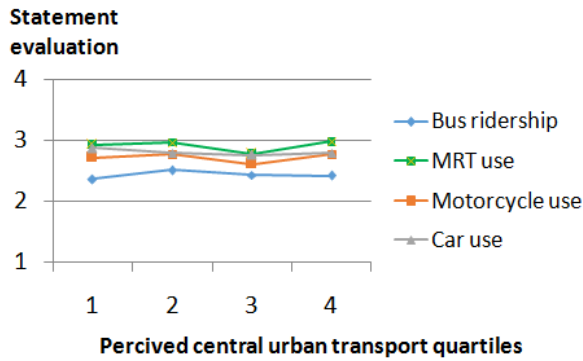

(a)
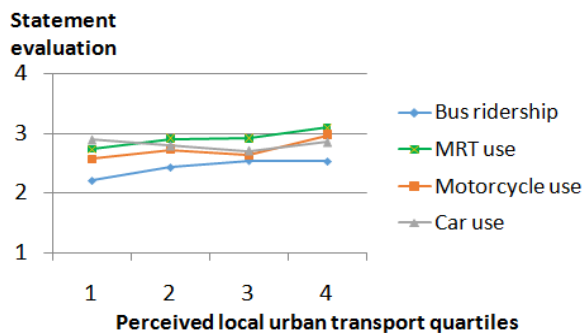
(b)

Fig.1 Behavioral intentions by perceived urban transport quartiles

### c)Relationship between traffic awareness and behavioral intentions

Figure 2 (a,b,c,d) presents how behavioral intentions change by different quartiles of perceived urban transport. It is found that the intentions of bus ridership and motorcycle use are related to bus safety belief. Moreover, motorcycle use awareness influences on bus ridership intention and car use concern affects MRT use intention.
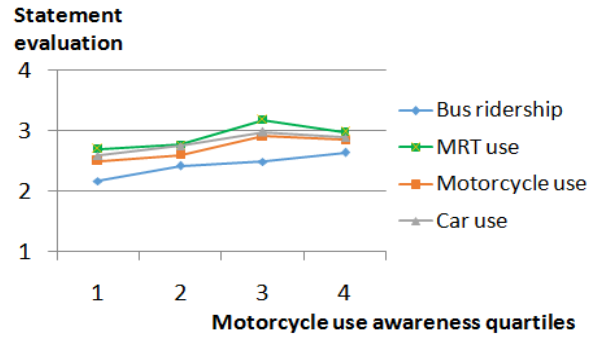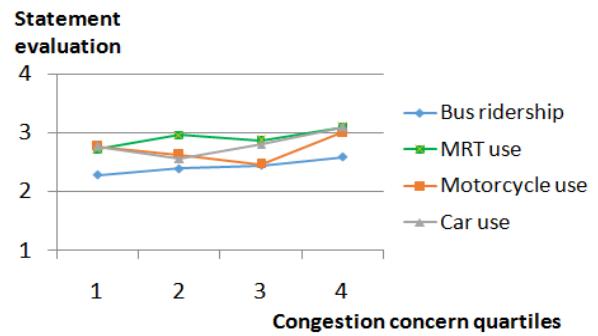

(a)
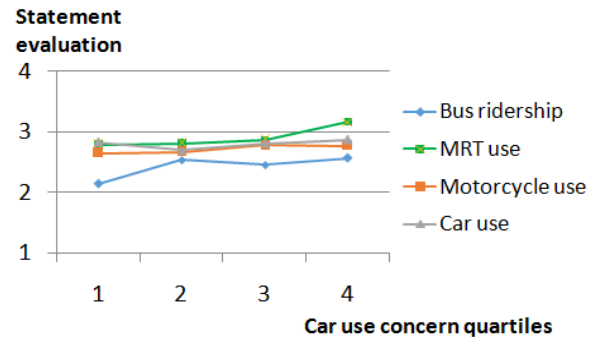
(b)
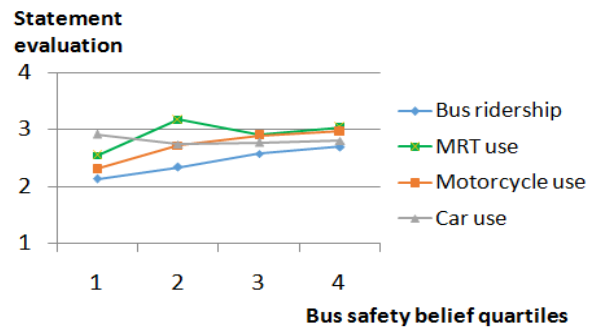
(c)

(d)

Fig.2 Behavioral intentions by traffic awareness quartiles

(3) Park and Ride preferences

Table 6 shows responses on Park and Ride (PR) trips (See Appendix C). Respondents who select *Strongly disagree* and *Somewhat disagree* are categorized in *Disagree group* while the others belong to *Agree group*. There are high agreements for scenarios relating to low parking fee, traffic congestion, and parking constraint in city center. Late working time is less considered for accessing MRT by private vehicle. For motorcycle use, long trips are also main reasons for PR trips.

In trade-off consideration, the rate of PR trips preferred is lower in car use than in motorcycle use (see Figure 3 and Figure 4). It means there are more difficulties in PR trip consideration for car use. Moreover, the rate of PR trips acceptance is lower in cost constraints than in time control. It can be concluded that travel cost has more influence on PR consideration than travel time, particularly in motorcycle use.

Table 6 Responses for Park and Ride trips

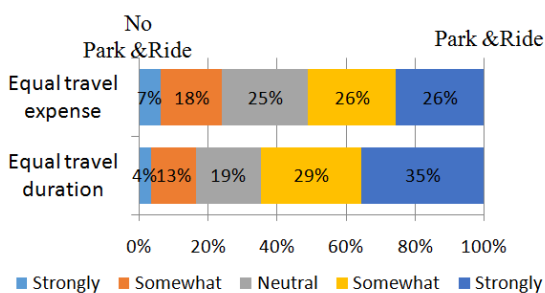| Item	Motorcycle use (%)		Car use (%)	
	Disagree	Agree	Disagree	Agree
Q25	30	70	37	63
Q26	31	69	38	62
Q27	28	72	28	72
Q28	45	55	43	57
Q29	35	65	43	57
Q30	18	82	39	61
Q31	24	76	23	77
Q32	20	80	12	88

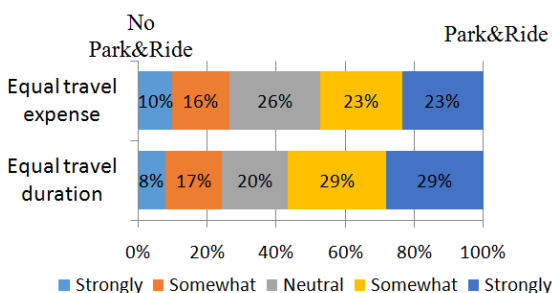**Fig.3** Responses for Park and Ride choices (motorcycle)

Fig.4 Responses for Park and Ride choices (car)

4. DISCUSSION AND CONCLUSION

It is found that parking difficulties and congestion problems influence on Park and Ride consideration more than other reasons for future MRT use. However, congestion concern is less likely to affect behavioral intentions. It indicates that existing traffic has not reached the levels of worsening condition yet. The introduction of mass rapid transit systems will be important contextual factor affecting behavioral intentions in comparison with urban context. People who have car use concern intend to use alternative transits to overcome future traffic congestion. This finding suggests that car use will be more influenced by traffic congestions in comparison with motorcycle use.

Motorcycle use awareness makes commuters want to have more bus ridership rather than mainly use private vehicle. However, motorcycle use awareness has no influences on less motorcycle drive. It can be explained that motorcycle use becomes a habit that is stronger than awareness of motorcycle ride. The intention of having more car use might be explained by other psychological factors different from traffic awareness and perceived urban transport. The belief in bus use safety is a determinant for commuters' intentions of bus ridership and motorcycle use. It indicates that planning for bus service should focus on safety enhancement to encourage more bus ridership in new urban areas. Finally, practices in MRT operation should concentrate on travel cost and station parking for shifting people from private vehicle to mass rapid transit.

In conclusion, the study has analyzed behavioral intentions with regarding to urban developments and new transit alternatives in a motorcycle-based context. The results show that motorcycle use awareness and perceived urban transport has little impacts on motorcycle use reduction in new urban areas. Further practices should improve public transport service to increase public perception on transit safety belief.

5. CITATION AND REFERENCE LIST

APPENDIX A
Items on perceived urban transport

Q1	How comfortable do you feel about traffic condition in city center?
Q2	How do you think about traffic safety when travelling in city center?
Q3	How do you assume people's driving behavior when riding in city center?
Q4	How do you assess traffic law enforcement in city center?
Q5	How comfortable do you feel about traffic condition in local neighborhood?
Q6	How do you think about traffic safety when travelling in local neighborhood?
Q7	How do you assume people's driving behavior when riding in local neighborhood?
Q8	How do you assess traffic law enforcement in local neighborhood?

APPENDIX B
Items on traffic awareness and behavioral intention

Q9	It is unsafe for driving motorcycle on highways.
Q10	It is impossible to drive motorcycle in bad weather.
Q11	I feel unsafe in driving motorcycle when I see bus fleets on streets.
Q12	It is risky to drive passenger car in such conditions overwhelmed by motorcycles.
Q13	I always feel nervous in travelling by car
Q14	I almost remember to fasten seatbelt when I get in a car.
Q15	Taking transit is safer than driving car.
Q16	I like to be a passenger than a driver even though I have a chance to drive.
Q17	Using public transport make me feel safer in daily travel.
Q18	I would like to leave my home early or to remain in my office late until traffic congestion eases.
Q19	If possible, I try not to travel in peak hours to avoid traffic congestion.
Q20	Traffic congestion influences much on my daily trip.
Q21	I intend to have more bus ridership rather than mainly use private vehicle.
Q22	I really want to drive motorcycle as less as possible.
Q23	I always want to have more car use frequency.
Q24	I am willing to use alternative transits those are not influenced by traffic congestion to travel to city center even thought I never or rarely use public transport.

APPENDIX C
Items on Park and Ride scenarios

Q25	I only commute in some specific weekdays.
Q26	My work place/school is not so far from last station (e.g 5-10 minute walk)
Q27	I can commute with free parking for motorcycle or discount parking for passenger car at transit stations.
Q28	The working time begins late (e.g 9 am) at my work place/school.
Q29	I have occasional trips (e.g shopping, leisure, private matter, event participation) at city center or area surrounding MRT stations.
Q30	I have a long trip (e.g more than 10 km or more than one hour) and go back my residence in the same day.
Q31	I have urgent trips in peak hours or at the time there might be traffic congestion
Q32	I might be aware that it is difficult to find parking places in city center.

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