The Intention of Modal Shift for Shopping Mall Visitors in Metro Manila Considering Consciousness of Private Car Use and Ownership

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Abstract: Asian developing countries are currently undergoing motorization. Rather than using public transportation modes, car owners tend to rely on their own vehicle. The objective of this study is to analyze personal car consciousnesses toward mode choice intentions as well as to examine the relationship between their socio-economic characteristics and consciousnesses. For this purpose, how people access to shopping mall in Metro Manila is selected as a case study. A questionnaire survey for shopping mall customers was conducted to ask their consciousnesses and mode choice selections. As the result, the consciousness of "rational mobility" was found to have significant influence on mode choice intentions. However, this consciousness appears mainly in high-income car owners. When the poor people would have car, they will become car dependent. When more public transportation is provided, the consciousnesses of people who would own car are important to encourage modal shift.

Keywords: Developing countries, Automobile dependence, Attitudes toward mode choice

1. INTRODUCTION

In Asian developing countries, motorization is ongoing more rapidly than economic growth and road supply. Car owners tend to avoid using public transportation. Linda (2005) reveals as motives for car use, an instrumental function (i.e., it enables activities), a symbolic function (i.e., the car is a mean to express yourself or your social position), and an affective function in connection with deeper, non-instrumental needs and desires. These functions may be considered as different types of motives for car use. If people value an instrumental function of car, modal shift will be expected when useful public transportation will be provided. However, if people have an automobile dependency at subconscious level, they will continue car use regardless the service level of each transportation mode. In regard to undergoing motorizations, many developing countries plan to provide rail-oriented public transportation. To anticipate whether modal share of car would be reduced significantly, analysis of car consciousness might be important.

The objective of this study is to analyze personal car consciousnesses toward mode choice intentions as well as to examine the relationship between their socio-economic characteristics

and consciousnesses. For this purpose, how people access to shopping mall in Metro Manila is selected as a case study. In Metro Manila, there are many public transportation modes, rail and road-oriented. However, the number of car has still been growing tremendously. Most shopping malls are located in the city center and some are provided with public transportation terminals for their customers to access easily without car. Then, it is worthy to analyze people's mode choice decision making to access for shopping mall.

In this study, a questionnaire survey for shopping mall customers was conducted to obtain their consciousnesses and mode choice selections. Through principal components analysis, artificial variables that specify the personal consciousnesses are extracted. To identify the effect of the consciousnesses on mode choice intentions, these principal component scores are integrated with discrete choice model. In addition, through a scenario analysis, effect of the consciousnesses on modal share in the city is estimated.

This article is organized in 6 parts. After the introduction, part 2 provides a brief overview of Shopping malls in Metro Manila. A description of conducted survey and result of principal components analysis is provided in part 3. A description and estimation result of desecrate choice model integrated with principal component score are discussed in part 4. Scenario analysis to identify the effect of car consciousness on modal share in the future is provided in part 5. In the last part, conclusion of this study is provided.

2. OVERVIEW OF SHOPPING MALLS IN METRO MANILA AND THEIR ACCESS

2.1 Overview of Shopping Malls in Metro Manila

The Philippines currently has a large number of shopping malls, and the world's largest malls are located in the center of Metro Manila. In the Philippines, visiting shopping malls is one of the most major leisure activities. The malls are places for various activities, such as shopping, meal, watching movie, and even celebration. Due partly to the high propensity to consume of Filipino, malls are crowded with people in different income levels.

Table 1. The Metro Manila's largest shopping malls and these floor areas

	SM City North EDSA	SM Mall of Asia	SM Megamall
Location (City)	Quezon	Pasay	Mandaluyong
Gross Floor Area (m^2)	424,691	406,961	346,789

2.2 The Characteristics of Access Transportation of Shopping Malls

In Metro Manila, many malls are located along EDSA: an important arterial road, and rail transit systems (see Figure 1). A large number of malls have relatively high accessibility from railway stations. In addition, there are various road-based public transportations in Metro Manila. And terminals for these modes are provided within the malls to attract customers who don't own car. Especially jeepneys, the most popular public transportation in the Philippines have many routes and provide frequent services. For Large malls, neighborhood can access by jeepneys. And even for malls in suburban area, buses and FX taxi, van services are provided.
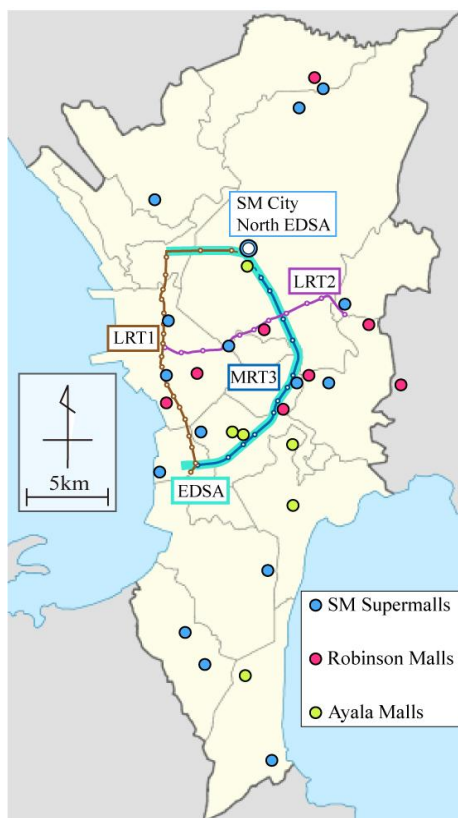
Fig 1. The distribution of the malls in Metro Manila

For example, the characteristic of access transportations of *SM City North EDSA* in Quezon City is focused. *It is* the largest mall in the Philippines, and the third largest mall in the world. It faces toward EDSA, and adjoins *Trinoma,* mall owned by Ayala group.

There are public transportation terminals in the mall. Access for FX taxi, jeepneys and tricycle (bike taxi) are provided. For bus, although pick ups/offs were taken on the road previously, to provide safety for the riding and ease traffic congestion along EDSA, bus bays were newly built in 2012,.

For FX taxi, there are 13 routes in *SM City North EDSA*, and 29 routes in *Trinoma*. They operate from the terminals, and mainly serve in the northward. Some routes extend to the out of Metro Manila. Jeepneys provide access from Quezon City and adjoining cities. The mall has 2 terminals of tricycle. Although tricycle can enter narrow streets, they can't go across the borders that are specified by the municipalities.

Figure 2. Jeepney terminal in *SM City*
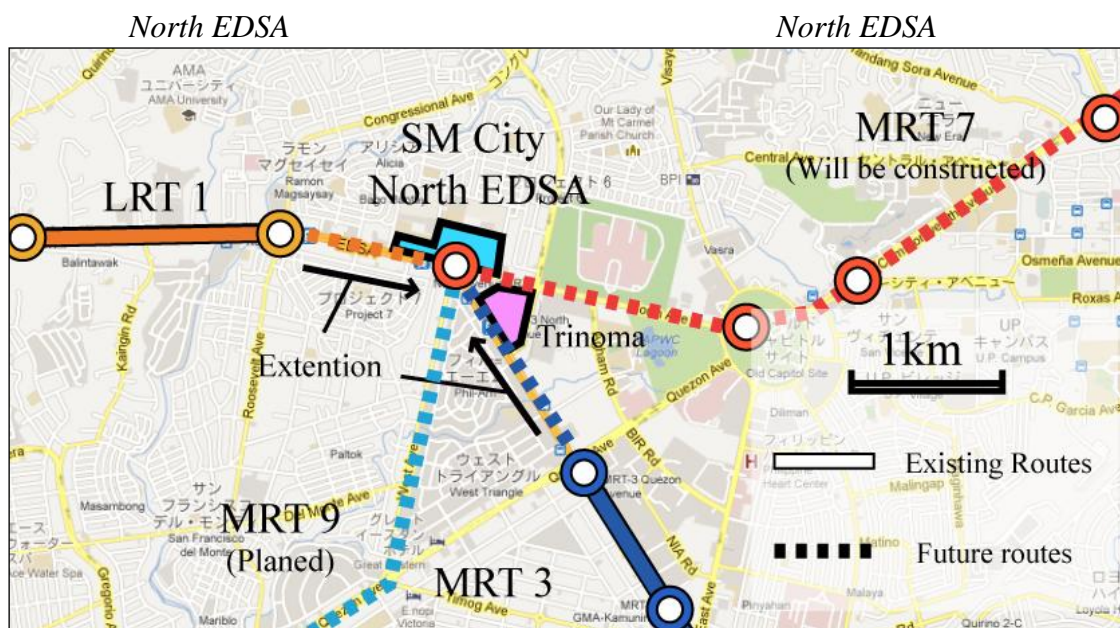

Figure 3. Tricycle terminal in *SM City*

Figure 4. Railway development plans in the vicinity of *SM City North EDSA*

2.3 The Parking Provision of Shopping Malls

As the parking regulations for particular facilities, National Building Code (NBC) is specified. In NBC, each facility must provide for minimum parking spaces. Some municipalities set their own parking regulations in their zoning ordinances. In NBC, complex facilities like shopping malls are required to provide parking spaces for different floor areas. Table 2 shows the parking regulations for shopping malls or similar facilities in some cities of the world. Corresponded with other cities, car ownership in the Philippines is low, and required minimum parking spaces are small.

Table 2. Parking regulations for shopping malls
or similar facilities in some cities of the world

Nation	Standards for Parking	
Philippines	Minimum	1 slot per GFA 100m^2
Yokohama (Japan)	Minimum	1 slot per GLA 33m^2 (For malls larger than 20,000m^2)
Portland (USA)	Max	1 slot per GFA 18.2m^2
	Minimum	1 slot per GFA 46.5m^2
Bangkok (Thailand)	Minimum	1 slot per GFA 20m^2

GFA: Gross Floor Area
GLA: Gross Leasable Area

According to the survey conducted in 2007, *SM City North EDSA* had a total of 3,556 parking spaces. At that time, the parking spaces had met the regulations by NBC. But this mall has been expanded recently, and there is no record of additional provision of parking spaces with its expansion.

3. QUESTIONNAIRE SURVEY FOR SHOPPING MALL CUSTOMERS

3.1 Overview of Survey

Metro Manila is undergoing railway development. Many existing railway stations are accessible to the Malls. As section 2.2, *SM City North EDSA* will be the terminal point of multiple routes.

When modal shift is encouraged by provision of rail based transportation, it is required to verify whether modal shift will be occurred actually. To analyze the effect of personal consciousnesses on usage of transportation modes, questionnaire survey was conducted.

In design of questionnaire, preliminary survey for students and staffs in University of the Philippines, National Center for Transportation Studies (UP NCTS) was conducted. As the result, there are intentions to use public transportation when they don't need to use a car for visiting shopping malls. Also, since there are various activities in shopping malls, questionnaire was designed to obtain the activities of customers.

Table 3. Overview of preliminary survey

Date	2012/ 08/ 02 and 03
Location	University of the Philippines National Center for Transportation Studies
Sample	Students and staffs in UP NCTS (N=39) 19 car owners and 20 non-car owners
Method	self-filling questionnaires survey and interview survey for some of samples
Items	Personal attribute and household's information
	Intentions to use public transportation for malls
	Consciousness about car use
	(Even for non-car owners, assume that it is possible to use one car freely.)

This survey was conducted for customers of *SM City North EDSA*. Overview of the survey is shown in Table 4. To obtain a certain number of samples by access modes, this survey was conducted at parking, public transportation terminal of the mall and the nearest MRT station. Because respondents got incentive what worth parking fee or fare of public transportation, most answers were valid.

Table 4. Overview of preliminary survey

Date	2012/ 11/ 24 , 25 and 26	
Location	*SM City North EDSA* Parking, Terminal and Nearest MRT station	
Sample	Mall customer (N=228)	
Method	Interview survey using questionnaire	
Items	Access to the mall on the day Access mode, accompany, origin	
	Activity at the mall on the day stay time, activities (shopping, recreation, etc)	
	Usual activity at malls Frequency of visiting malls, stay for long time	
	Travel intentions for mall in particular situation Shown in Fig 10	
	Questions about your lifestyle	
	1	I am (was) dreaming of owning my car
	2	(I think) It's fun to ride a car
	3	When I travel, I value comfort more than cost.
	4	When I travel, I value cheaper cost more than safety.
	5	When I travel, I value predictable travel time more than cost.
	6	I feel that I can't afford to help others(especially poor people).
	7	I tend to go with trends *(nakikiuso)* such as iPhone, iPad, Android
	8	I like the term "*Bahala na* (leave it to God.)": I think I am carefree.
	9	I often act without a plan for the day
	10	I tend to care more about the present than the future.
	11	Besides malls, there are some places to buy daily necessities.
	12	Besides malls, there are some places for leisure activities.
	13	If it is possible, I would use car for travel.
	14	Even If I can use car, I would walk for short distance(300m).
	15	Even If I can use car, I would use public transportation when I can get the destination directly (without transfer).
	16	If it is possible to go to shopping mall by public transportation easily, I feel that the mall is accessible to us.
	17	If it is possible to go to shopping mall without walking for a certain distance, I feel that mall is accessible to us.
	Daily travel Car ownership and use, PT use	
	Personal attribute and household's information Gender, age, household income	

3.2 Sample Attribute

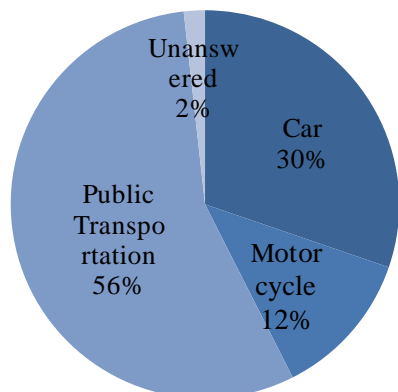The attributes of survey samples are shown below.
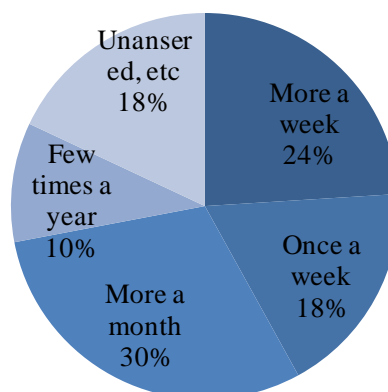

Figure 5. Access modes to the mall (N=228)

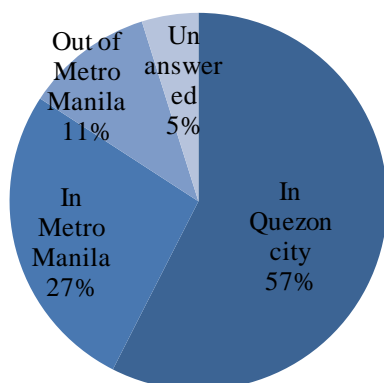Figure 6. Frequency of visiting the mall (N=228)
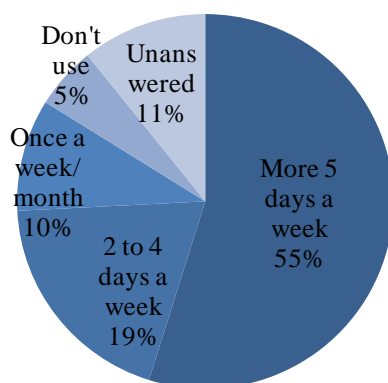

Figure 7. Origins of samples (N=228)
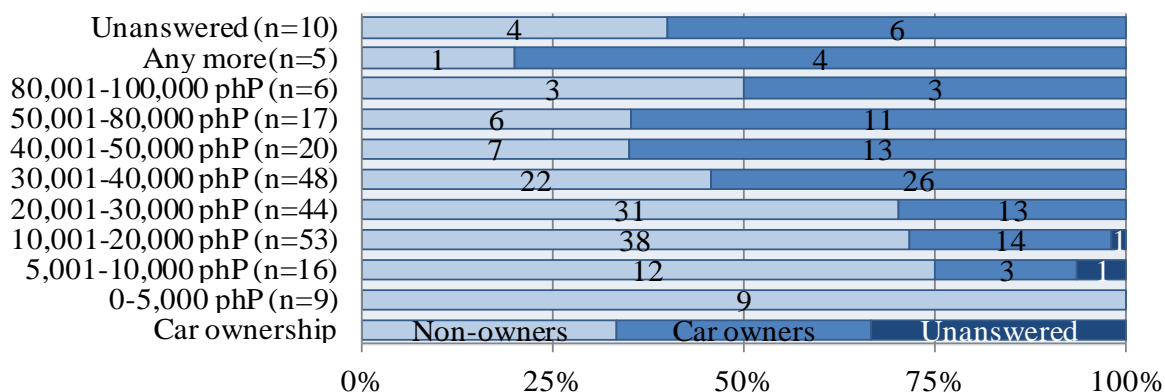

Figure 8. Frequency of car use (N=93)

Figure 9. Distribution of household monthly income class and their car ownership

3.3 Extraction of Personal Consciousness

As shown in Table4, *questions about your lifestyle* are included in the questionnaire. These questions ask their consciousness about car use, and attitudes or values in lifestyle. Participants responded to 17 items that asked them to rate on a 4-point Likert-style scale (1 = strongly disagree, 4 = strongly agree). From their answers, principal components were

extracted (see Table 5).

Table 5. Loadings for principal component analysis with varimax rotation.

	Principle components			
	1	2	3	4
Even If I can use car, I would use public transportation when I can get the destination directly(without transfer)	.835	-.024	.026	.189
If it is possible to go to shopping mall by public transportation easily, I feel that the mall is accessible to us.	.761	.161	.059	-.002
Even If I can use car, I would walk for short distance (300m).	.754	.098	-.016	-.042
If it is possible to go to shopping mall without walking for a certain distance, I feel that mall is accessible to us.	.738	.170	-.017	.067
If it is possible, I would use car for travel.	.442	.374	.293	.144
(I think) It's fun to ride a car	.137	.922	.050	.038
I am (was) dreaming of owning my car	.103	.909	-.099	.042
When I travel, I value comfort more than cost.	.448	.478	-.067	.205
I like the term "Bahala na (leave it to God.)": I think I am carefree.	.008	-.129	.854	-.125
I tend to go with trends (nakikiuso) such as iPhone, iPad, Android	.007	.020	.613	.500
I often act without a plan for the day	.053	.100	.609	.110
When I travel, I value cheaper cost more than safety.	.047	-.056	-.053	.758
I feel that I can't afford to help others (especially poor people).	.126	.210	.100	.747
Squares of loadings (%)	19.5	15.0	11.0	10.5
Cumulative squares of loadings (%)	19.5	34.5	45.4	55.9

The first principle component (PC1) has high loadings for questions about their mobility. People with high score of the component tend to use car for travel if they possible. But they use other ways when car is need not necessarily, and evaluate the accessibility of shopping malls. So the first principle component can be interpreted as "rational mobility". If someone with high consciousness of rational mobility, use car as a common way of transportation, they depend on car because the service levels of other modes are low. So when more suitable public transportation will be provided, they would change their mode choice. Instead, if someone with low consciousness of rational mobility, use car as a common way of transportation, they have an automobile dependency at a subconscious level.

The second principle component (PC2) has high loadings for questions about longing for car, and can be regard as "car longing". The third principle component (PC3) has high loadings for questions mean "carefree lifestyle". The fourth principle component (PC4) has high loadings for questions mean "price-sensitive lifestyle".

3.4 Examination of the Effect of Attributes on the Consciousnesses

For the extracted principle components, people have different propensities. For example, some have high consciousness of "rational mobility (PC1)" and others don't. To examine the effect of attributes on the consciousnesses, the principle component scores for different attribute groups were compared. Analysis of variance for the scores of PC1 and PC2 for car ownership and household income (more than 30,000 phP) was conducted (See Table 6).

For PC1 that means consciousness of "rational mobility", it appears only in high–income (more than 30,000 phP) car owners. In other words, non-car owners and low-income car

owners tend to have low score of PC1. The low-income car owners have an automobile dependency at a subconscious level. Furthermore, non-car owners tend to ignore rational mobility and they will become car dependent when they will own car.

For PC2 that means consciousness of "longing for car", the scores differ in car owners and non-car owners. Regardless their income, car owners have high scores of PC2 (they like car).

Table 6. Result of analysis of variance for principle component scores

	n	PC1 (Rational mobility)		PC2 (Longing for car)	
		Avg	Var	Avg	Var
High - income / car owner	45	0.355	1.14	0.636	0.34
Low - income / car owner	22	-0.141	1.10	0.519	0.37
High - income / non - car owner	33	-0.252	0.57	-0.244	0.91
Low - income / non - car owner	77	-0.128	0.97	-0.443	1.16
Proportion of variation		3.244		16.93	
P – value		0.023		1.1E-9	

4. DISCRETE CHOICE MODELING WITH PERSONAL COUNSCIOUSNESSES

4.1 Discrete Choice Model

The discrete choice model is developed to capture the mode choice probabilities of people. In order to identify the effect of personal consciousnesses on mode choice intentions, the principal component scores are integrated with discrete choice model. Respondents are asked to answer the question for hypothetical situation. In this study, questions about travel for the mall (*SM City North EDSA*) in following situations are ask to answer with "yes" or "no"(See Figure 10).
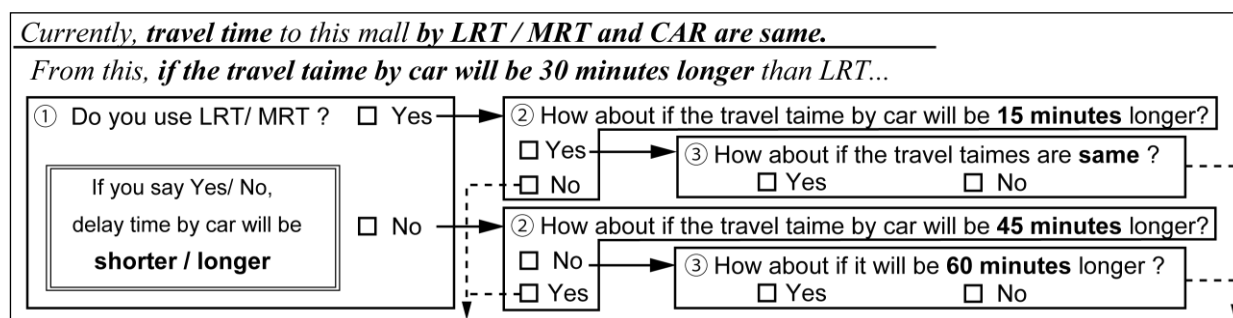

Figure 10. Comparisons question used to develop the model

As variables for the utility function, the difference of travel time by LRT/MRT and car, principal component scores mean personal consciousnesses, activities at mall, and socioeconomic characteristics are included.

4.2 Estimation result of the models

Table 7 shows the estimation result of discrete choice model. In this parameter, positive values mean these factors contributed to use LRT/MRT. And negative values mean these factors contributed to use car.

Table 7. Estimation Result of Discrete Choice Model

Variables	β	t	
LRT/MRT Constant	-0.576	2.91	**
The difference of travel times by LRT/MRT and car,	0.050	11.77	**
1st Principle Component Score (Rational Mobility)	0.424	4.75	**
2nd Principle Component Score (Longing for Car)	0.147	1.63	
3rd Principle Component Score (Carefree Lifestyle)	0.041	0.49	
4th Principle Component Score (Price-Sensitive Lifestyle)	-0.151	1.69	
Female	-0.808	4.29	**
Children Under 5 Years in the Household	0.347	1.67	
Often Stay the Mall for long time	-0.429	2.31	*
Often Use Car for Commuting	-0.339	1.41	
Use LRT/MRT Once or More a Month	0.591	3.33	**
Over 40 years	-0.260	1.45	
Have greater monthly household income than 30,000 phP	0.130	0.72	
Number of samples	186		
$\bar{\rho}^2$	0.174		

4.3 Discussion of the result

For the principle component scores meaning personal consciousnesses, PC1 (consciousness of rational mobility) was the most important attribute, and it was statistically significant. It was found that the consciousness of mode choice with rational thinking contributes to modal shift when new public transportation will be provided.

For dummy variables means the personal attributes. It was found that activities at the mall and lifestyles effect on their mode choice intention. For example, if someone stays at this mall for long time, he would use car because he is not sensitive for travel time to the mall. And if people who use LRT/MRT once or more a month, they use LRT easily.

Additionally, females show strong intentions to use car (t-value was also high). Referring to the scores of PC2 (longing for car) for gender, females don't like car as much as males (See Table 8). They chose car by other reasons from longing for car. For a question "When I travel, I value cheaper cost more than safety", the cross tabulation sorted by gender is shown at Figure 11. It shows that there are many females who value safety for travel. There is a possibility that females have the intention to use car due to the anxious about safety or security. Furthermore, it is said that Metro Manila is far from walkable city, and public transportation users can hardly walk for access and egress. It was found that improvement of public transportation, such as security and walk environment is required to encourage modal shift in the city.

Table 8. t-test result of PC2 scores for gender

	N	Average	Std.Error	t value	Probability.
Male	135	0.103	.969	2.286	2.3%
Female	52	-0.266	1.040		

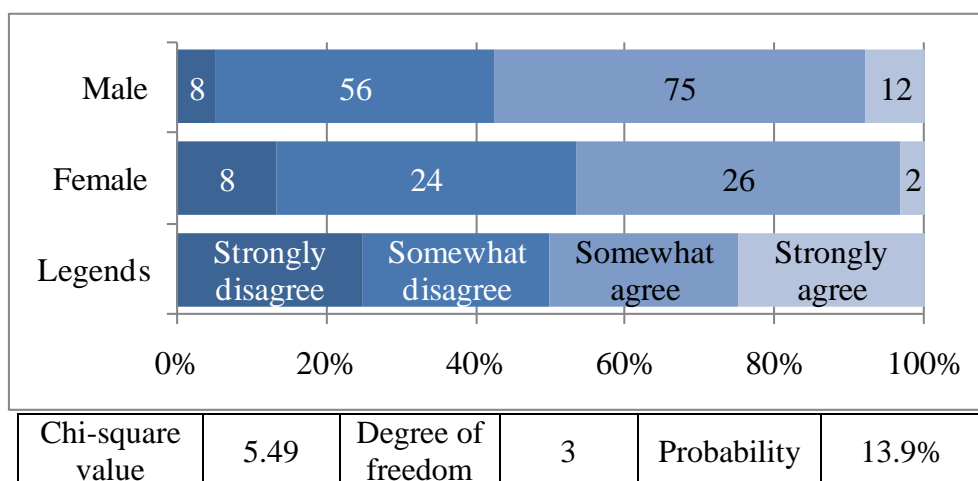| Chi-square value | 5.49 | Degree of freedom | 3 | Probability | 13.9% |

Figure 11. Chi-square-test result of answer about question "When I travel, I value cheaper cost more than safety." for Gender

5. SCENARIO ANALYSIS OF MODAL SHIFT FOR SHOPPING MALL ACCESS

5.1 Scenario Developments and Assumptions

In previous sections, the consciousness of "rational mobility" has significant influence on mode choice intentions. To quantify the effect of its consciousness on future mode choice in the city, a scenario analysis is conducted. In this analysis, provision of railway transit and changes of personal consciousness are assumed as scenarios. As the output, future mode choice for visiting a shopping mall is focused on.

Starting from North Avenue station that will be constructed adjoining *SM city North EDSA*, the MRT-7 will run in a northeast direction (see Figure 12). By this project, access and egress to the mall from Quezon City will be improved significantly. In this scenario analysis, modal shift for the samples that visited the mall from Quezon City (n=131) is estimated. Assuming these samples visit from the alongside of MRT-7 stations, and travel time by MRT is 15 minutes shorter than car. According to the travel time to the mall from Quezon City by car and traffic congestion in the city, 15 minutes, assumed difference for travel time is regarded as valid value.

For car ownership, a situation the car ownership will be doubled is assumed. For samples from Quezon City (n=131), 53 people currently own their car. In this analysis, current non-car owners will be randomly selected, and assumed that newly own their car.

Table 9. Scenarios about car ownership and the ratio of car owners and non-car owners

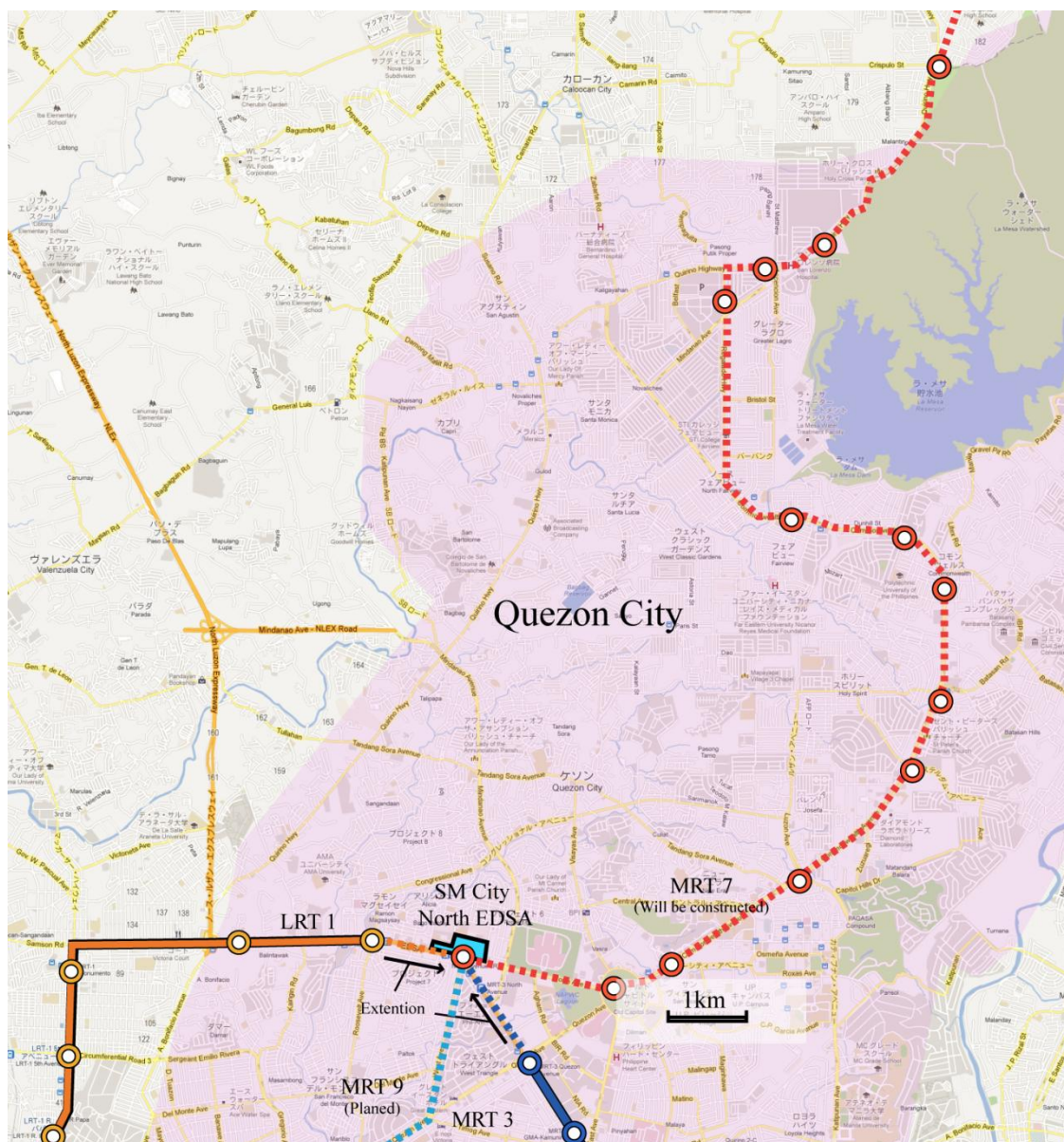| Samples	Samples from Quezon City (n=131)	
Scenarios about car ownership	Current situation	When the number of car owner will be doubled
Car owners	53	106
Non-car owners	78	25
New car owners in scenario		53

Figure 9. Overview of the planed route of MRT Line 7

For personal consciousness, 2 scenarios shown in Figure 11 are assumed. In section 3.4, consciousness of "rational mobility" appears mostly in high–income (more than 30,000 phP) car owners, and low-income car owners and non-car owners tend to neglect its consciousness. In this analysis, whether its consciousnesses will change toward "rational mobility" is focused. The 2 scenarios about personal consciousness are shown below.
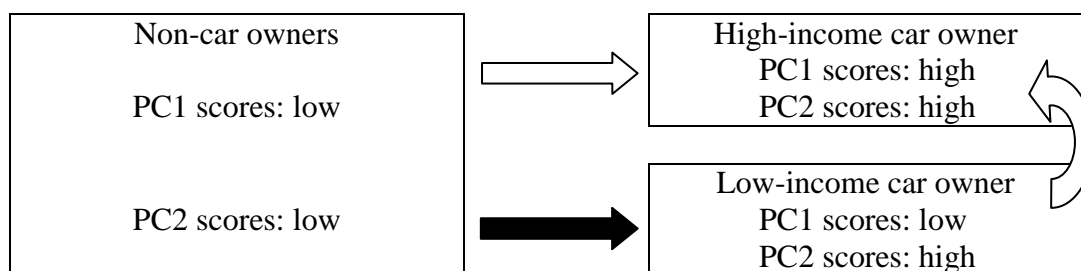
[Scenario　A]
All car owners (new car owners and low-income car owners) will have consciousness of rational mode choice, as well as high-income car owners.
[Scenario　B]
New car owners will have an automobile dependency at a subconscious level, as well as low-income car owners.

For each scenario, the usages of car and MRT are estimated. For PC2 scores, mean "longing for car" of new car owners, it is assumed to be equal to the average scores of all car owners.

Non-car owners PC1 scores: low PC2 scores: low		High-income car owner PC1 scores: high PC2 scores: high
		Low-income car owner PC1 scores: low PC2 scores: high

Scenario A	PC1 scores for new car owners and low-income car owners will be equal to the average scores of high-income car owners (0.355)
Scenario B	PC1 score for new car owners will be equal to the average scores of low-income car owners (-0.141)

*PC2 score for new car owners will be equal to the average scores of all car owners(0.597)

Figure 11.   scenarios about consciousness of people

As mode choice model for car and MRT under these scenario, the model developed in section 4 was simplified (see Table 10).

Table 10. Mode choice model used in the scenario analysis

Variables	β	t	
LRT Constant	-0.519	2.85	**
The difference of travel times by LRT and car,	0.050	11.77	**
1st Principle Component Score (Rational Mobility)	0.461	5.28	**
2nd Principle Component Score (Longing for Car)	0.210	2.43	*
Female	-0.711	3.92	**
Often Stay the Mall for long time	-0.445	2.44	*
Often Use Car for Commuting	-0.484	3.62	**
Use LRT/MRT Once or More a Month	0.627	2.26	*
Number of samples	186		
$\bar{\rho}^2$	0.175		

5.2 Result of Scenario Analysis

The result of scenario analysis is shown in Table 11. For samples from Quezon City (n=131), 53 people currently own their car, and 40 people visited the mall by car on the day of survey. After the provision of MRT, It is assumed that more than half of current car owners will use MRT. For car owners, high-income owners tend to have consciousness of "rational mobility", and many people will shift their travel modes. However, when the number of car owners will be doubled, usage of each mode was significantly different with their consciousnesses. The result shows that if new car owners will have consciousness of rational mode choice, many of them would shift to MRT from car.

Table 11. The result of scenario analysis, usage of car and MRT for each scenario

Car ownership		Current situation		Twofold of current situation	
Scenarios about personal consciousness		A	B	A	B
Non-car owners		78	78	25	25
		59.5%	59.5%	19.1%	19.1%
Car owners	Use MRT	31	30	60	47
		23.7%	22.9%	45.8%	35.9%
	Use Car	23	32	59	46
		17.6%	16.8%	45.0%	35.1%
The number of people shift to MRT by change of consciousness		1		13	
		4.3% of 23 people shift their mode		22.0% of 59 people shift their mode	

This result is in the case that travel time by MRT is 15 minutes shorter than car. In this survey, nearly 60% of samples visited *SM city North EDSA* from Quezon City. So after MRT will be constructed, a certain number of customers would reduce travel time to the mall by MRT. However, if there is a little difference between travel times of MRT and car, the people would hardly use MRT.

Furthermore, when the number of car owner will be doubled, the number of car users will exceed current number (40) regardless their personal consciousness. It means that even if the modal shift will be implemented successfully: railway networks are advanced and personal consciousnesses will change toward "rational mobility", when the car ownership will increase, the total number of attracted vehicle trips will be greater than current number.

According to the field survey, occupancy rate of multi-level parking in *SM City North EDSA* was more than 80% of the capacity. When the number of car owner will be doubled, even if the modal shift will be implemented successfully, parking demand would outstrip the capacity. Growth of car ownership to twofold is the possible future in Metro Manila. So the parking regulation for shopping malls involves the need to revise with growth of car ownership.

6. CONCLUSION

This study analyzes personal consciousness toward mode choice intentions as well as to examine the relationship between their socio-economic characteristics and consciousnesses. For this purpose, how people access to shopping mall in Metro Manila is selected as a case study.

As the result, high-income car owners have consciousness of rational mode choice. Because high-income car owners are thought to use car due to the instrumental function of car, they are expect to shift their travel modes when the service levels of public transportation will be improved. On the other hand, non-car owners and low-income car owners tend to have an automobile dependency at a subconscious level. Even if the service levels of other modes will be improved, they would remain to use car.

When car will become popular with low-income people, many people would consider only car as a way of transportation. When more public transportation will be provided, whether modal shift will occur or not is influenced by personal consciousnesses of people who will

own car in the future. Even in developing countries, the discussion of the need and approach to change personal consciousnesses would be important.

On the other hand, even if the modal shift will be implemented successfully, when the number of car owner will be doubled, the number of visitors by car will exceed current number. Although it is important to advance discussion of service levels for public transportation, traffic volume will increase with car ownership in the city. In Metro Manila, railway development is ongoing to encourage modal shift from car. However, not only that, it is also necessary to review the parking regulations with motorization in the city.

ACKNOWLEDGEMENTS

REFFERENCE

Linda Steg. (2005) Car use: lust and must. Instrumental, symbolic and affective motives for car use, Transportation Research Part A, 39

The Epoch Times THE WORLD'S NEWS PAPER: 'Malling' con-sumes Philippines shoppers (2008)

Hilario Sean O. PalMIANO, Takeshi KUROKAWA, Ricardo G. Sogua. (1999) SHOPPING CENTERS IN METRO MANILA AND NECESSITY FOR TRAFFIC IMPACT STUDY, Journal of the Eastern Asia Society for Transportation Studies, Vol.3

The website of SM Super Mall (http://www.smsupermalls.com/)

National Building Code of Philippines

Yokohama city: Act on the Measures by Large-Scale Retail Stores for Preservation of Living Environment - use standard - (http://www.city.yokohama.lg.jp/keizai/jourei/gaiyo.html)

Planning and Zoning, Bureau of Planning and Sustainability, City of Portland, Oregon (http://www.portlandonline.com/bps/index.cfm?c=31612)

University of Philippines, National Transportation Science Center. (2007) Transportation and Traffic Study for SM City North EDSA