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Study on the Mode Choice Characteristics of Customers of Supermarkets in Metro Manila

マニラ市におけるスーパーマーケットの顧客の交通機関選択行動に関する研究

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ABSTRACT
This paper investigates the mode choice characteristics of customers of supermarkets in Metro Manila. Based on the field survey made on several supermarket locations, mode choices are characterized according to several purchase and trip characteristics. It clarifies how goods sizes, travel time, age, trip frequency, and other factors affect mode preference of customers.

要旨
本研究は、マニラ市におけるスーパーマーケットの顧客の交通機関の選択行動を明らかにすることを目的としている。そのために、顧客が購入する商品の大きさ、旅行時間、顧客の年齢、トリップ数などを実態調査し、交通機関の選択行動が顧客の購買する商品とトリップの特長によって異なることを明らかにしている。

1. INTRODUCTION

Metro Manila's transportation system can be characterized by a large variety of vehicle types. Significant variety of the vehicle types belonging to the public transportation system that has been widely used by passenger and at the same time for goods movement such that passengers had a tendency to carry large number or heavy goods used for personal or business purposes.

The roles of each of the transportation mode for passengers particularly those visiting supermarkets within Metro Manila are interesting on the point of view of logistics. The combination passenger and purchased goods might have a particular behavior different from work trips and leisure trips.

There has also been a phenomenal growth in the retail market in Metro Manila particularity in the number of large commercial complexes, including those of supermarkets. Supermarkets are also moving towards hypermarkets concepts which retail not only food but those of general merchandizes and wholesale operation.

1.1. SIGNIFICANCE OF THE STUDY

Consumer behavior is of particular interest for this research. Abundance of supermarkets produces behavioral character combined with abundance of alternative transportation found in Metro Manila.

Selection of supermarket in terms of location for customers depends on a variety of factors such as accessibility and gratification factors. However, these factors are difficult to collect and analyze. An alternative way to analyze customer behavior is to directly analyze their actual trip characteristics for both shopping and home trips.

Customers of supermarkets also have a particular transportation requirement as a character with regards to the goods carried back to their houses.

2. PURPOSE OF THE STUDY

2.1. PURPOSE

The purpose of the study is to determine a glimpse of the characteristics of customers of supermarkets in Metro Manila in order, and to give some facility planning suggestion.

2.2. METHODOLOGY

Customers have four generalized characteristics as classified by marketing researches: 1) They have a particular need, 2) They have enough money to buy products, 3) They have decision making power, and 4) They need to have access to products. Based on these basic characteristics it can be clarified that customers purchase what they need and for this research this will measured in volume, which would be expressed in the number of goods.

Decision making factors will be expressed in terms of socio-economic profile such as sex, age, and expenditure profile. Access to products is a choice for customers. This factor will be expressed in terms of travel time and travel mode.

Customer characteristics profiling will start with an interview survey at the location of supermarkets. Customer profiling of socio-economic, purchase and trip characteristics will be made. Finally this will be further analyzed by cross-tabulations.

3. DEFINITIONS OF TERMS

For this study the following section describes the definition of terms used particularly those of transportation mode and goods sizes. Classification of supermarkets will also follow.

3.1. TRANSPORTATION MODE

Transportation modes were classified according the table 1 below. Brief descriptions of the modes are also written to differentiate them. Transportation modes unique to the Philippines like *pedicab* and *tricycle* has been included as an alternative mode. The official definition of these unique transportation modes is inconsistent so the description describes only their physical appearance.

Table 1: Mode Classification

Mode	Description
Walk	Walking
Bicycle	Two-wheel non-motorized vehicle
Pedicab	Three-wheeled non-motorized for-hire with driver, also called Padyak
Tricycle	Three-wheeled motorized for-hire with driver with capacity for 3 passengers
Jeep	Four-wheeled motorized with driver with capacity ranging from 16 to 18 passengers, also called Jeepney
Bus	Regular Buses
Car	Private vehicles
Taxi	For-hire Cars
FX	For-hire Vans for 6-10 individual passengers, also called Mega-Taxi
Train	Elevated light-rail vehicle

For simplification of the data collection during the survey, it is necessary to group the modes to reduce the number of alternative modes for each of the customers. Bike and Pedicab were classified into one category for they are non-motorized transportation. Jeep and Buses were classified into one category for they are public transportation modes which are basically not competing for the same market. Taxi and Cars are also grouped into one category for they belong to private use.

3.2. SIZES OF GOODS

Purchased goods at supermarkets are mostly carried by its customers. Most are contained in cellophane

bag (which will be called baskets for here forward) and sometimes in boxes. Goods were placed in bags by the cashier but regularly by assistant baggers. Baskets are usually full before another basket is used. Goods are also sorted and segregated by another smaller cellophane bag before it is placed to the basket.

For this study, the unit of measure for counting the number of goods purchased is by basket and box. These containers are typically the same for major supermarkets in Metro Manila. The description of goods sizes are given on table 2.

Table 2: Goods Size Classification

Sizes	Description
Basket	A unit of measure containing an assortment of consumer goods which is about the size of a regular cellophane grocery bag which is about 25cm (L) and 20cm (W)
Box	A unit of measure containing an assortment of consumer goods which is packed carton-box dimension varies

4. SURVEY

4.1. PURPOSE OF THE SURVEY

Primary data collection is necessary to combine the customer profiling, purchase and trip characteristics. Secondary data will only be used as necessary.

The survey was intended to determine the costumer characteristics primarily in selection of transportation mode with considerations on some social, trip, and consumption characteristics.

4.2. DATA ITEM

The following items were collected in the survey:

- Age – indicates the age of customers in years
- Sex – describes the gender
- Frequency – describes the number of times customers visit a supermarket
- In Mode – is the mode used to go to supermarkets
- Out Mode – is the mode used to go home with the purchased goods
- Travel Time – is an approximate trip time, in minutes between the house and supermarket
- Amount – is the amount of purchase, in pesos at the supermarket
- Size of goods – describes the number of goods purchased in terms of number of baskets

4.3. CHARACTERISTICS OF SUPERMARKET

For the collection of data, a total of six (6) locations of supermarkets were selected as indicated on table 3. The survey was conducted outside of the premises of the supermarkets due to restrictions on space and business operation of the establishment. The sizes of the supermarkets are only approximates go have an idea the scale of the business operation. Also the goods indicated are the main retail goods sold at the establishment and they may be selling more than those indicated.

Table 3: Supermarket Description

Supermarket	Location	Approx Size	Goods
SM Shoemart (3)	Lawton	16,000 sq.m	Food Apparel Hardware Appliance Services
	Centerpoint		
	San Lazaro		
Liana's (2)	Earnshaw	6,000 sq.m.	Food Hardware
	P. Tuazon		
Queens	Anonas	8,000 sq.m	Food

The survey was done by personal interview of customers from February 22 to February 28 and there were about 500 respondents.

5. OUTLINE OF SURVEY RESULT

Based on the 500 customers interviews about 433 customers have complied with the required information structure for this research. Those with incomplete, irregular, and incomplete information were removed from these base data.

5.1. PROFILE OF THE RESPONDENT

GENDER: Out of the 433 customers, 300 are females and 132 are males with 1 respondent did not reply. The gender profile has more females compared to males with a ratio of about 3 females to 1 male. Based on the gender profile of FY2000 gathered by the National Statistics Coordination Board (NSCB) of the Philippines, Metro Manila (NCR) has about 5,054,718 females and 4,877,842 males for all ages.

Table 4: Customer Gender Profile

Gender	Customers		NCSB[1]
	Number	Share	
Female	300	69.3%	51.8%
Male	132	30.5%	48.2%

AGE: Out of the 433 customers, 105 (24.2%) people are between 15-24 years old, 195 (45.0%) are between 25-39 years old, 109 (25.2%) are between 40-54 years old, 18 (4.2%) are between 55-69 years old, and 1 respondent is above 70 years old.

Table 5: Customer Age Profile

Age in Years	Customers		NSCB[1]
	Number	Share	
15 to 24	105	24.2%	30.5%
25 to 39	195	45.0%	37.9%
40 to 54	109	25.2%	21.4%
55 to 69	18	4.2%	7.7%
70+	1	0.2%	2.5%

[1] National Statistics Coordination Board (NSCB) of the Philippines, Metro Manila (NCR), FY2000

5.2. FREQUENCY AND AMOUNT

FREQUENCY: Out of the 433 customers, table 6 shows the frequency of their visitation to retail stores. Based on the result, it shows that majority visit retail stores one a week or about 36% of the customers. About 23% and 24% visit retail stores twice a month and every month, respectively. Only about 2% visit everyday and about 15% visit twice a week.

Table 6: Supermarket Visitation Frequency

Frequency	Number	Share
a) Everyday	7	2%
b) Twice a week	64	15%
c) One a week	158	36%
d) Every other week	103	24%
e) Every month	100	23%

AMOUNT SPENT AT SUPERMARKET. The amount used in purchases in retail store is shown in table 7. The amount in Philippine Peso is grouped by 500 as indicated. It shows that most spent around 500-1000 pesos, which is about 24% of the total.

Table 7: Customer Spending Characteristics

Amount Group (in Pesos)	Number	Share
Group 1 (0-500)	63	14.5%
Group 2 (500-1000)	104	24.0%
Group 3 (1000-1500)	67	15.5%
Group 4 (1500-2000)	59	13.6%
Group 5 (2000-3000)	54	12.5%
Group 6 (3000-5000)	61	14.1%
Group 7 (5000-10000)	11	2.5%
Group 8 (10000-up)	4	0.9%

5.3. SIZE OF GOODS

Based on the survey, the total number of goods per customer determined. Majority of the number goods sizes are from 1 to 3 baskets with shares 24.2%, 28.4%, and 21.5%, respectively. It can also be understood that most of the purchases are minimal in

number. However, some purchases can still be considered many and which is about 10.2% customers purchase about 4 baskets. Some have also indicated more than 5 boxes which are about 7.9 percent.

Table 8: Goods (Purchased) Size Profile

Size of Goods	Number	Share
a) One (1) Basket	105	24.2%
b) Two(2) Baskets	123	28.4%
c) Three (3) Baskets	93	21.5%
d) Four (4) Baskets	44	10.2%
e) Five (5) Baskets	22	5.1%
f) More than 5 Baskets	34	7.9%
g) One (1) Box	1	0.2%
h) Two (2) Boxes	6	1.4%

5.4. IN / OUT MODE

"In" and "Out" mode are collected and differentiated modes. Based on the result of the survey, about 40% of the customers used Taxi or Private Car to visit retail stores in Metro Manila. About 30% used Jeeps or Bus. It should be noted that about 11.1% walked to supermarkets.

Table 9: Mode Usage Profile: "In" Share

In \ Out	Walk	Bike/Ped	Tricycle	Jeep/Bus	Taxi/Car	FX Van	Train	No Reply	In Total
Walk	35	8	1	1	2	1	0	0	48
	89.7%	36.4%	2.0%	1.0%	1.0%	3.0%	0.0%	0.0%	11.1%
Bike/Ped	2	13	4	1	0	0	0	0	20
	5.1%	59.1%	10.3%	1.0%	0.0%	0.0%	0.0%	0.0%	4.6%
Tricycle	0	0	32	0	1	0	0	0	33
	0.0%	0.0%	82.1%	0.0%	0.5%	0.0%	0.0%	0.0%	7.6%
Jeep/Bus	1	0	1	93	28	4	0	1	128
	2.6%	0.0%	2.6%	92.1%	14.1%	14.3%	0.0%	50.0%	29.6%
Taxi/Car	1	1	1	4	164	2	0	0	173
	2.6%	4.5%	2.6%	4.0%	82.8%	7.1%	0.0%	0.0%	40.0%
FX Van	0	0	0	2	3	21	0	0	26
	0.0%	0.0%	0.0%	2.0%	1.5%	75.0%	0.0%	0.0%	6.0%
Train	0	0	0	0	0	0	4	0	4
	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%	0.0%	0.9%
No Reply	0	0	0	0	0	0	0	1	1
	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	50.0%	0.2%
Total	39.00	22.00	39.00	101.00	198.00	28.00	4.00	2.00	433
	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Table 9 shows the importance of Taxi/Car on its role for trips going to supermarkets and with least role of Trains.

Mode going back home are vehicles used to go home from retail store. Most of the trips going home used Taxi or Car which is about 45.7%. This was then followed by Walking and Tricycles with an equal share of 9.0%. Table 10 shows that taxi/car remained its lead role for home trips and followed by Jeeps /Buses.

Table 10: Mode Usage Profile: "Out" Share

In \ Out	Walk	Bike/Ped	Tricycle	Jeep/Bus	Taxi/Car	FX Van	Train	No Reply	total
Walk	35	8	1	1	2	1	0	0	48
	72.9%	16.7%	2.1%	2.1%	4.2%	2.1%	0.0%	0.0%	100.0%
Bike/Ped	2	13	4	1	0	0	0	0	20
	10.0%	65.0%	20.0%	5.0%	0.0%	0.0%	0.0%	0.0%	100.0%
Tricycle	0	0	32	0	1	0	0	0	33
	0.0%	0.0%	97.0%	0.0%	3.0%	0.0%	0.0%	0.0%	100.0%
Jeep/Bus	1	0	1	93	28	4	0	1	128
	0.8%	0.0%	0.8%	72.7%	21.9%	3.1%	0.0%	0.8%	100.0%
Taxi/Car	1	1	1	4	164	2	0	0	173
	0.6%	0.6%	0.6%	2.3%	94.8%	1.2%	0.0%	0.0%	100.0%
FX Van	0	0	0	2	3	21	0	0	26
	0.0%	0.0%	0.0%	7.7%	11.5%	80.8%	0.0%	0.0%	100.0%
Train	0	0	0	0	0	0	4	0	4
	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%	0.0%	100.0%
No Reply	0	0	0	0	0	0	0	1	1
	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%	100.0%
Out Total	39	22	39	101	198	28	4	2	433
	9.0%	5.1%	9.0%	23.3%	45.7%	6.5%	0.9%	0.5%	100.0%

For the analysis of mode change based on figure 1, visual analysis would show that customers retained their mode meaning the same mode of transportation is used for "in" and "out" modes. Further analysis would show that mode change is significant all throughout the alternative modes. Jeep/Buses showed a decrease of 26% followed by Walk by 25% and Train by 23percent. The gainers a re Bike/Pedicab, Tricycle, Taxi/Car and Fx Van with 7, 15, 14, 6 percent gain respectively.

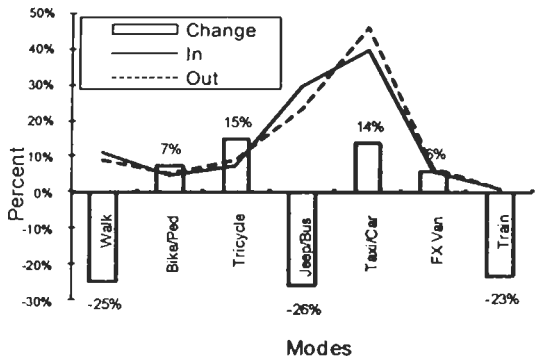

Figure 1: Mode Change for Customers

5.5. TRAVEL TIME

Travel time influences the mode choice and supermarket location by consumers. From figure 2, majority of trips are about 26 to 30minutes.

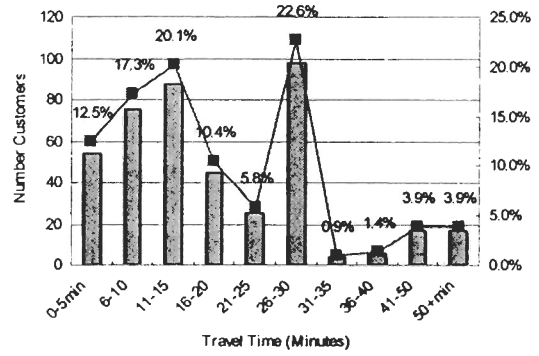

Figure 2: Customers Travel Time

6. RESULT OF MODE CHOICE

A cross analysis of two elements are made to have a more detailed analysis on customer characteristics.

6.1. SHARE OF MODE

SHARE OF MODE WITH SIZE. Mode and sizes are cross-tabulated and the result is showed in figure 3. "Out" mode is the transportation vehicle used from the supermarket

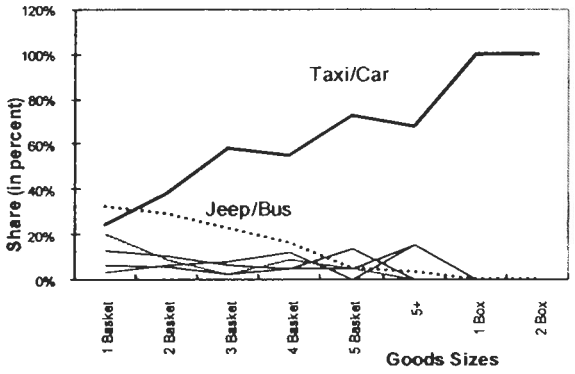

Figure 3: Goods Size and "Out" Mode Share

With the increase in goods sizes, mode share of taxi/car increased on a phenomenal rate. As compared with other modes only jeep/buses have significant share but like other modes except taxi/car, their mode share decreased.

SHARE OF MODE WITH TIME. The share of modes with respect to travel time is shown in figure 4. Based on the graph each alternative mode has different behavior relative to travel time. As compared with the previous graph, the share of taxi/car increased with time but seemed to diminish on the end. Jeep/bus share remained relatively flat all throughout the range of travel time. FX Van has minimal share for short distance trips but gained share for long trips. Walking as has a large share for short distance trip and significantly diminished up to 11 to 15 minutes range.

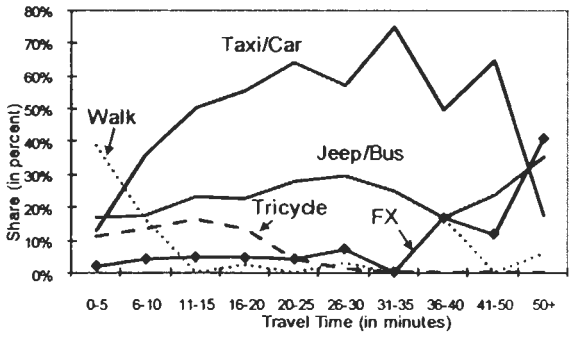

Figure 4: Travel Time and "Out" Mode Share

SHARE OF MODE WITH FREQUENCY. Mode share with respect to trip frequency is shown in figure 5. Mode share of taxi/car remained significant for weekly up to monthly trips. Jeep/bus share also has the same behavior but with less share compared with taxi/car. Majority walked for daily trips to supermarkets.

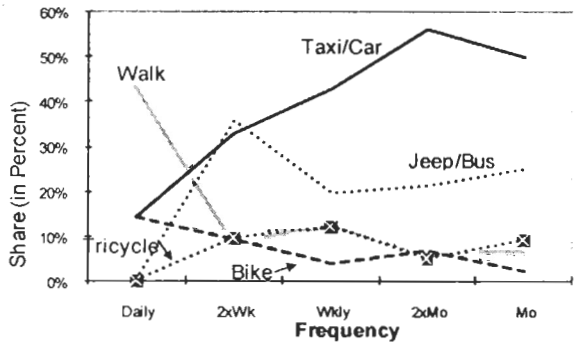

Figure 5: Frequency and "Out" Mode Share

6.2. SHARE OF SIZE

SHARE OF SIZE WITH TIME. Goods sizes share with respect to travel time is shown in figure 6. It shows how each goods size share change relative to travel time. For example, share of 1 basket lessen with the increase in travel time.

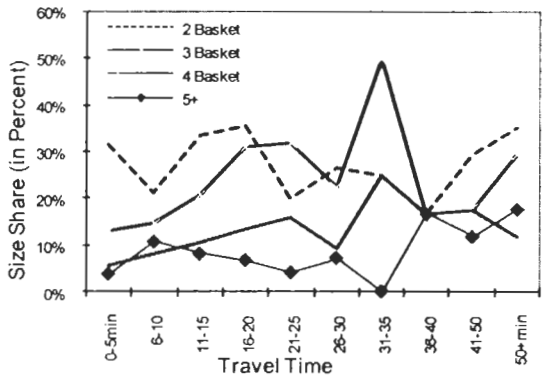

Figure 6: Graph of Travel Time and Goods Sizes

Using regression analysis to predict good sizes using travel as an independent variable travel time reveals the equation: Size = 1.33 – 0.001 (Travel Time)

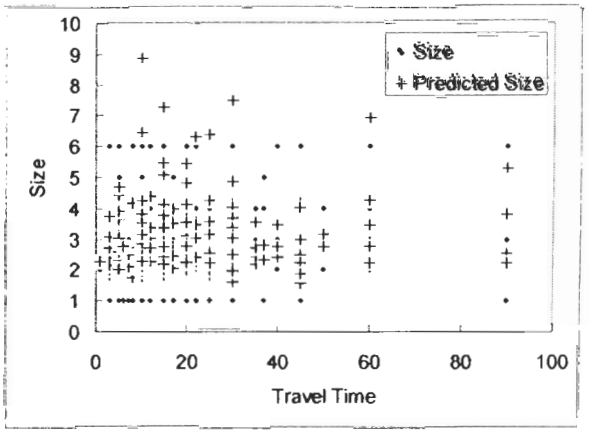

Figure 7: Travel Time and Goods Sizes Fit

It can be clarified from the plot above that travel time (P value=0.81, R^2= 0.36) is not a good predictor for goods size.

SHARE OF SIZE WITH AGE. Based on figure 8 below, with the exception of 2 baskets, a general trend shows that most of the goods sizes decrease relative to the increase of customers age.

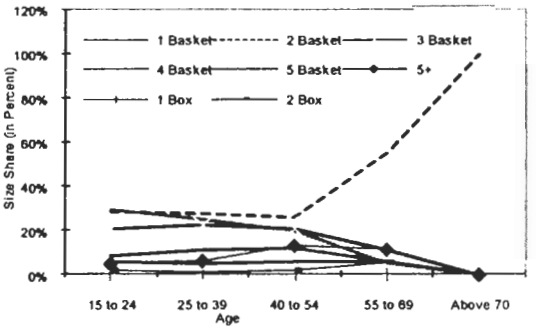

Figure 8: Graph of Age and Goods Sizes

SHARE OF FREQUENCY WITH AMOUNT. The share of trip frequency relative to amount of purchases is shown on figure 9. Weekly trip's share remained relatively significant as compared with other frequency shares. Twice a month trips has relatively even share all throughout the shopping amount range. The share of daily, twice a week decreased with the increase in shopping amount.

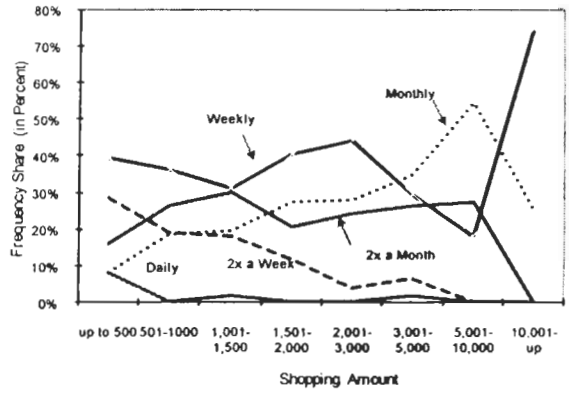

Figure 9: Line Graph of Amount and Frequency

7. ANALYSIS

GENERAL PROFILE.

1. Most customers are at the age range of 25 to 39 years old (38%) and 15-24 years old (30%) which majority visit every week that spends who spends around 2,000 pesos
2. Majority spends on the range of 500 to 1,000pesos with a share of 24%
3. Majority carry (size of goods) about 1 to 3 baskets which is about 72% of all customers
4. Customers use similar vehicle types both for in and out mode and for those shifting modes they would prefer a taxi/car as mode for going home

CHARACTERISTICS PROFILE.

1. Customers use similar vehicle types both for in and out mode and for those shifting modes they would prefer a taxi/car as mode for going home
2. There is an increase of taxi/car users with the increase in the number of goods carried
3. Travel time affects usage of taxi/car and FXvan are preferred for trips longer than 50minutes
4. Walking is mostly used for daily trips and short distance up to 10mins. Taxi/car are the preferred mode for weekly to monthly trips such that longer travelers tend to purchase more goods as compared to short trips

8. CONCLUSION

Based on the analysis above, the characteristics of customers of supermarkets towards mode preference are clarified. The chosen factors show significant changes on mode preference. For planning customer transportation space of supermarkets, space allotment is estimated to be taxi/car (50%), jeep/bus (30%), Tricycle (10%), and FxVan (7%), Bike/Ped (3%) and is recommended based on in/out modes result. This suggests that adequate parking, loading and unloading space planning should be considered for all these modes. However, the national building code of the Philippines only allocates spaces for cars (1 space for every 100-150sqm of floor space) and delivery trucks (1 slot per 5,000 floor space).

In the viewpoint of logistics, customer mode shifters due to the effects of goods sizes pose a potential for facility and service revisions to retain the mode used for "in" and "out". Mode type variety exists in the loading and unloading area where design criteria should not only consider customer/passenger movements but also goods movement facilities. In delivery areas for trucks, mode types also exist and that unloading platform should also be design to be suitable not only to trucks but also for vans, cars, tricycles and so forth. Services for goods delivery and public transport that provide vehicle space for purchased goods would be beneficial for passengers.

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