Mode of Public Transportation in Cotabato City.

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Abstract: A study on mode choice benefits engineers, transportation planners and policy makers to better understand the transportation system and forecast the future needs of the proposed transportation system of a city. This study focused on determining the available mode of public transportation in Cotabato City and the factors that influence the commuters' modal choice. Among the various identified mode of transportation available in the city, jeepneys and multicabs (local name for small version of jeepney) are the most frequently used public transportation from home as their point of origin to different destinations such as work/school, market, central business district and downtown. Socio-demographic, socio – economic profile of the commuters and factors such as accessibility, comfort and fare have influence in commuters modal choice of public transportation.

Keywords: Transport, mode choice, public transportation

1.   Introduction

Cotabato City is located in Region 12, at the South Central Mindanao, comprising of 37 barangays with a total of 299,438 residents as of 2015 (PSA, 2015). Along with the economic growth of the city was the increase of transportation demands, and due to this increasing demand, different public transportation vehicles multiply year after year which are widely used within the city's premises. Heavy traffic has been observed in different major intersections in the city during peak hours.

This study was focused on determining the available mode of public transportation in the city and the factors that influence the commuter's modal choice from their respective home as the point of origin to different destinations. These destinations are (a) work/school, (b) markets, (c) central business district (CBD) and (d) down town area.

This study will benefit the Cotabato City Planning Office to better understand the current transportation behavior in the city and could be the basis for their future planning including the formulation and assessment of transport/traffic policies and strategies.

2. Related Literature

Mode choice analysis is one of the most essential stages in transport planning process and has a big role to play in policy making decisions (Minal, 2014). Mostly in travel models,

the mode choice has already been estimated where the origin and destination are already known. Mode choice models require input variables about the traveller that is available for the trip and gives the proportion of travellers which would use each mode of transport (Davidson et al, 2006).

Gardner and Abraham (2007) concluded that providing greater service information and more interactive services like real-time timetable information may have a result to boost the individual's perception control with public transport. Urban mobility management actions and policies would be better if commuter's perception have taken into consideration (Tyrinopoulos and Antoniou, 2012).

Influenced by a wide range of cultural, economic, environmental and social factors, the mode choice of commuters may vary. These factors are travel time, travel cost, number and ease of transfers and comforts (Bhat, 2000). Nicolau and Mas (2005) found income and education are factors that may also have effects regarding on the travel decision of an individual. Ben-Akiva and Bowman (2001) said age, income, travel time and cost as the mode choice variables to predict passenger's travel behavior.

According to the researches and surveys of Wang et al. (2014), the traveller's characteristics and travel attributes e.g. race, age, income, car ownership and occupations which are affecting the travel choice behavior can be categorized as personal attributes and service of travel mode. It was stated that travellers with higher income would likely to choose a more comfortable mode and commuters prefers travel modes with punctuality such as metro.

3. Sampling procedure and data gathering

The respondents of the study were commuters residing in Cotabato City. The respondents were individuals who are eligible to own a driving license, i.e. individuals who are 17 years old and older which was based on the study of Chee and Fernandez (2013).

The total numbers of respondents were determined using Slovin's Formula with 10% marginal error. There were 100 respondents from different barangays comprising the city. Stratified random sampling was used to determine the distribution of respondents in every barangay. Survey questionnaire was used for data gathering.

4. Results

As shown in Table 1, most of the respondents (48%) were aged between 21 to 25 years old and 66% were single. The respondents were almost equally distributed in terms of gender, where 58% were male and 42% were female. Majority of the respondents were Islam (65%), 26% were Roman Catholic and 9% were Protestants. 50% of the respondents were employed and 24% are students. And majority of those employed have monthly income ranging from Php 5, 000 to Php10, 000.

Table 1. Characteristics of the Respondents

Variables	Category	Frequency N = 100	Percentage (%)
Age	17 – 20	9	9
	21 – 25	48	48
	26 – 30	17	17
	31 – 35	15	15
	36 – 40	6	6
	41 – 45	2	2
	46 – 50	1	1
	51 – 55	2	2
Sex	Male	58	58
	Female	42	42
Religion	Roman catholic	26	26
	Islam	65	65
	Protestant	9	9
Civil status	Single	66	66
	Married	30	30
	Separated	2	2
	Widow/ widower	2	2
Employment	Employed	50	50
	Self-employed	10	10
	Unemployed	16	16
	Student	24	24
Monthly gross income	Below 5,000	8	8
	5,000 – 9,999	20	20
	10,000 – 14,999	10	10
	15,000 – 19,999	5	5
	20,000 – 24,999	9	9
	25,000 – 29,999	6	6
	30,000 – 34,999	5	5
	35,000 – 39,999	1	1
	40,000 & above	4	4

4.1 Modes of public transportation

There are various mode of public transportation available in the city. Jeepneys are traditional and the most popular public transportation in the Philippines and multicab are smaller version of jeepneys. Motorcycles are locally called *habal habal*, which function as motorcycle taxi. Taxis are cars that are often used as non-shared ride and convey passengers. Tricycle, also known as motored tricycles, and motorcycles with a cab attached to its side to carry more passengers. *Payong-payong*, derived from the word *payong* which means umbrella, is a smaller version of tricycle, motor operated with an umbrella to protect passenger from heat or rain. *Padyak*/*sikad* is bicycle, manually driven by the driver, with an attached cab to carry 2 to 3 passengers.

Jeepneys and multicabs are the main mode of public transportation from home as their origin to different destinations (work/school, markets, CBD and downtown) while motorcycle, tricycle, *payong-payong* and *padyak/sikad* are those used by commuters as egress or access modes. Commuters very seldom used taxis.

Figure 1. (a) Tricycle, (b) *Payong payong*, (c) *Padyak* and (d) Motorcycle (habal habal)

4.2 Factors considered by the commuters in choosing public transportation

The commuters identified the factors that they considered in choosing public transportation. 49 (16.33%) respondents considered the accessibility as a factor in choosing their mode of transportation which results as the most considered factor in the study. Comfort and distance were also the factors often considered by the respondents upon choosing their choice of transportation with a frequency count of 46 (15.33%) and 45 (15%) respectively. The 38 (12.67%) respondents said that the transportation fare was one among the considered factor. 34 (11.33%) respondents considered the travel time and 29 (9.67%) respondents considered the safety and security as their factor that influences their choice of transportation. Social event was the least factor considered by the respondents having a frequency count of 9 (3%) which comes after the weather factor having a frequency count of 14 (4.67%).

Table 2. Factors considered by the commuters in choosing public transportation, Cotabato City, 2018.

Factors	Frequency N = 300	Percentage (%)
Accessibility	49	16.33
Capacity of the transportation / Crowding	36	12
Comfort	46	15.33
Distance	45	15
Fare	38	12.67
Safety and security	29	9.67
Social event	9	3
Travel time	34	11.33
Weather	14	4.67

4.3 Transportation frequency

Table 3 shows the transportation frequency of the respondents for each mode. It shows how often the respondents choose their transportation on a weekly basis. As shown in the table, frequency of usage was classified into (5):

5 – Always   2 – Seldom
4 – Mostly   1 – Never
3 – Average

The weighted mean was calculated and the mean were the basis in describing how frequent they travel using the different modes of transportation. Jeepney or multicabs were the "mostly" used mode of transportation. Vehicles like motorcycle, tricycle, *payong – payong*, *padyak* or *sikad* and private vehicle were "averagely" used mode of transport. Taxis were "never" used by the respondents as their transportation.

Table 3. Frequency of use of each transportation mode, Cotabato City, 2018.

Mode of transportation	Never (1)	Seldom (2)	Average (3)	Mostly (4)	Always (5)	Wt. Mean	Mean description
Jeepney / Multicab	4	16	9	18	53	4.0	Mostly
Motorcycle	4	15	34	27	20	3.46	Average
Taxi	74	20	5	0	1	1.34	Never
Tricycle	23	29	11	22	15	2.77	Average
Payong – Payong	15	34	31	10	9	2.61	Average
Padyak / Sikad	22	30	26	15	7	2.55	Average
Private Vehicle/ Ride Sharing	29	28	13	9	21	2.65	Average

4.4 Variables that influence the frequency of using different mode of public transportation.

Cross tabulation was used to determine if variables have significant influence to the frequency of use of a certain mode of transport. Table 4 shows the variables that significantly influence the use of a particular mode of transportation.

Table 4. Variables that influence the frequency of using different mode of transportation, Cotabato City, 2018.

VARIABLES		Significant Influence						
		Jeepney/ Multicab	Motorcycle	Taxi	Tricycle	Payong-payong	Padyak	Private vehicle
Socio-demographic	Age	.005**	0.192	.004**	0.02*	0.431	0.169	0.034*
	Gender	0.5	0.792	0.094	0.928	0.723	0.217	0.798
	Religion	0.31	0.245	0.586	0.629	0.567	0.82	0.69
	Civil status	0.611	0.581	0.968	0.606	0.957	0.338	0.942
	Employment	0.181	0.209	0.939	0.019*	0.082	.007**	.005**
	Income	.003**	.004**	.000**	0.304	0.728	0.337	0.229
Factors	Access	0.27	.020*	0.595	.042*	0.686	0.038*	0.052
	Capacity	0.115	0.369	.040*	0.139	0.532	0.182	.021*
	Comfort	0.518	.026*	0.391	0.895	0.56	0.372	.037*
	Distance	.023*	0.666	0.577	0.618	0.175	0.344	0.187
	Fare	0.115	0.553	0.102	0.972	0.682	0.991	.005**
	Safety	0.128	0.755	0.171	0.165	0.658	.037*	0.544
	Social	0.114	0.746	0.153	0.654	0.514	0.478	0.097
	Ttime	.004**	0.413	0.532	.003**	0.295	.017*	.015*
	Weather	.002**	0.612	0.082	0.245	0.24	0.497	.014*

* significant
** highly significant

Age, income, distance, travel time and weather were the significant variables that affect the commuters' frequency of using jeepney or multicabs. Meanwhile, monthly income, accessibility and comfort were the significant variables that affect the frequency usage of motorcycles. Significant variables that Influence the frequency usage of taxi by the commuters are age, monthly income and crowding. On the other hand, the variables influencing the frequency usage of tricycles are age, employment, accessibility and travel time. The frequency usage of *padyak* or *sikad* is most likely influenced by employment, accessibility, safety and security and travel time. Lastly, significant variables that affects the frequency usage of private vehicles are age, employment, crowding, comfort, fare, travel time and weather.

4.4.1 Frequency in using jeepney or multicab

Table 5 shows the variables that significantly affect the frequency of using jeepney or multicabs.

Table 5. Variables that influences the frequency of using jeepney or multicab

	Variables	Frequency of using jeepney/ multicab					Total	Wt. Mean
		Never	Seldom	Average	Mostly	Always		
Age	17-20	0	2	2	0	5	9	3.889
	21-25	1	6	3	13	25	48	4.146
	26-30	2	3	1	1	10	17	3.82
	31-35	1	0	0	2	12	15	4.6
	36-40	0	4	1	0	1	6	2.667
	40 & above	0	1	2	2	0	5	3.2
Income	Below 5k	0	7	3	8	24	42	4.095
	5k – 9.99k	0	2	1	4	13	20	4.3
	10k – 14.99k	0	1	0	0	0	1	2
	15k – 19.99k	0	0	1	1	3	5	4.4
	20k – 24.99k	1	2	2	1	3	9	3.333
	25k – 29.99k	1	1	1	2	1	6	3.167
	30k – 34.99k	1	1	1	2	0	5	2.8
	35k – 39.99k	1	0	0	0	0	1	1
	40k & above	0	2	0	0	0	2	2

Results show that majority of commuters that always use jeepney or multicab aged between 21 and 25 and has income of below Php 10,000.

4.4.2 Frequency in using motorcycle or *habal-habal*

A table provided below shows the variables that significantly affect the frequency of using motorcycle or *habal-habal*.

Table 6. Variables that influences the frequency of using motorcycle or *habal-habal*

	Variables	Frequency in using motorcycle					Total	Wt. Mean
		Never	Seldom	Average	Mostly	Always		
Income	Below 5k	0	6	15	14	7	42	3.524
	5k – 9.99k	0	3	8	6	3	20	3.45
	10k – 14.99k	0	1	2	3	4	10	4
	15k – 19.99k	1	2	0	1	1	5	2.8
	20k – 24.99k	1	0	4	0	4	9	3.667
	25k – 29.99k	0	1	4	1	0	6	3
	30k – 34.99k	1	0	1	2	1	5	3.4
	35k – 39.99k	1	0	0	0	0	1	1
	40k & above	0	1	1	0	0	2	2.5

The results show that most of the commuters having income of below Php 5,000 commonly used motorcycle or *habal-habal* as their transportation.

4.4.3 Frequency in using taxi

In table 7, it shows the variables that significantly affect the frequency of using taxis.

Table 7. Variables that influences the frequency of using taxi

	Variables	Frequency in using taxi					Total	Wt Mean
		Never	Seldom	Average	Mostly	Always		
Age	17-20	6	2	1	0	0	9	1.44
	21-25	36	11	1	0	0	48	1.27
	26-30	12	4	0	1	0	17	1.41
	31-35	13	0	2	0	0	15	1.267
	36-40	2	4	0	0	0	6	1.667
	40 & above	3	1	0	0	1	5	1.8
Income	Below 5k	31	9	2	0	0	42	1.31
	5k – 9.99k	16	2	2	0	0	20	1.3
	10k – 14.99k	8	2	0	0	0	10	1.2
	15k – 19.99k	3	2	0	0	0	5	1.4
	20k – 24.99k	7	2	0	0	0	9	1.222
	25k – 29.99k	3	2	0	1	0	6	1.833
	30k – 34.99k	3	2	0	0	0	5	1.4
	35k – 39.99k	1	0	0	0	0	1	1
	40k & above	0	1	0	0	1	2	3.5

The results shows that most of the commuters aged between 21 and 25 years old and having an income of below Php 5,000 never used taxi as their transportation.

4.5 Variables that influence the commuters' modal choice from home as origin to different destinations.

Cross tabulation was used to determine if variables have significant influence to the commuter's modal choice from home as origin to different destinations. Table 8 shows the variables that significantly influence the commuter's modal choice from home as origin to work/school, market, CBD and downtown.

Table 8. Variables that influenced the commuter's modal choice from home to different destinations, Cotabato City, 2018.

	VARIABLES	Significant Influence			
		Home to work/school	Home to market	Home to Central Business District	Home to downtown
Socio-demographic	Age	0.024*	0.033*	.045*	.002**
	Gender	0.074	0.692	0.122	0.79
	Religion	0.288	0.914	.044*	0.597
	Civil status	0.637	0.041*	.012*	.000**
	Employment	0.000**	0.125	0.067	0.093
	Income	0.000**	0.222	0.273	0.000**

Factors					
	Access	0.179	0.23*	0.059	0.013*
	Capacity	0.344	0.117	0.32	0.706
	Comfort	0.028*	0.000**	0.019*	0.017*
	Distance	0.152	0.113	0.584	0.811
	Fare	0.078	0.040*	0.336	0.109
	Safety	0.219	0.571	0.226	0.774
	Social	0.865	0.867	0.071	0.414
	Time	0.275	0.316	0.225	0.345
	Weather	0.15	0.685	0.12	0.147

* significant
** highly significant

Influencing the mode choice of transportation of the commuters traveling from home to work or school are age, employment, income, comfort and weather. Meanwhile, age, civil status, accessibility, comfort and transportation fare are the significant variables that likely affects the mode choice of transportation of the commuters traveling from home to market. Furthermore, age, religion, civil status and comfort are the influencing variables that are significant to the commuters traveling from home to central business district. Upon traveling from home to downtown, age, civil status, monthly income, accessibility and comfort are determined to be the significant variables that affect the mode choice of transportation of the commuters.

5. Summary, Conclusion and Recommendation

Using jeepney and multicab are influenced by age, income, distance of travel, travel time and weather. Using motorcycle or *habal habal* is influenced by income, accessibility, and comfort. The use of Taxi is influenced by age, income and capacity, while the use of tricycle is influenced by age, employment, accessibility and travel time. Using *padyak* is influenced by employment, accessibility, safety and travel time. And the use of private vehicle is being influenced by age, employment, capacity of the vehicle, comfort of the passenger, fare, travel time and weather.

Jeepney or multicabs were widely used transportation mode within the city. *Habal-habal* or motorcycles were also often used as transportation while taxis were seldom used by the commuters.

The commuters modal choice from home to work/school is influenced by the age, employment, income and comfort; modal choice from home to market is influenced by age, civil status, accessibility, comfort and fare; modal choice from home to CBD is influenced by age, religion, civil status and comfort; and modal choice from home to downtown is being influenced by age, civil status, income, accessibility and comfort.

The results can be used by the city's urban transportation planning office for the future planning strategy of the city. Since motorcycles or *habal-habal* are also widely used by the commuters and the researcher suggests having a policy regarding its fare matrix since most of these commuters are having an income of below Php 5,000. The researcher also suggests

promoting the usage of taxis in the city since accessibility, comfort and distance greatly affects the transportation choice of the commuters.

In general, since comfort is the mostly influencing factors in all aspects, the policy makers need to be strict in regards with the physical conditions of the different public transportation of the city to increase the commuters' satisfaction.

For further research regarding the mode choice of transportation in Cotabato City, the researcher recommends additional respondents for the study to be able to make a transport modelling and predict the future demands. With these data, additional analysis and interpretation of the commuters and their travel behavior can be of great help improve the urban transportation planning for the city.

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