Research Title:

Airport Access Mode Choice Behavior of Air Passengers under the introduction of City Air Terminal in Vientiane Capital, Laos.

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HiTEL-HilRM Regular seminar

2020, April 23

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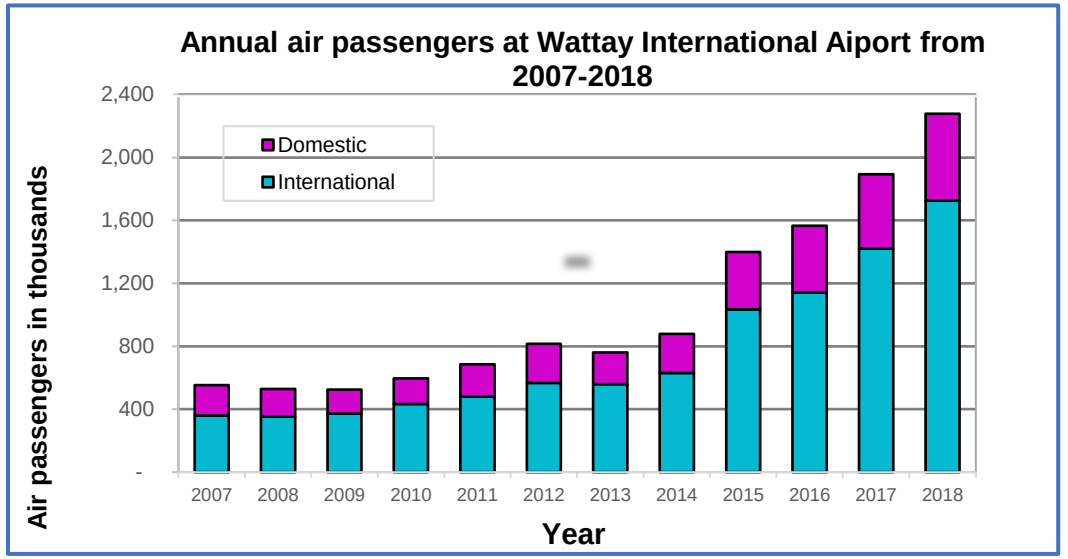
CONTENTS

BACKGROUND

- Wattay International Airport (WIA) situates in Vientiane capital, Laos, and covers more than 60% of annual air passengers. It increases average rate of 13% annually from 2007 to 2018. In 2018, the air passenger reached approximately 2.3 million (Department of Civil Aviation of Laos, 2019), and it trends to rapid increase annually.

- The annual air passenger will be reached 6.3 million air passengers in 2040 (JICA, 2013). Thus, the airport will be crowded by its air passengers and airport ground access.



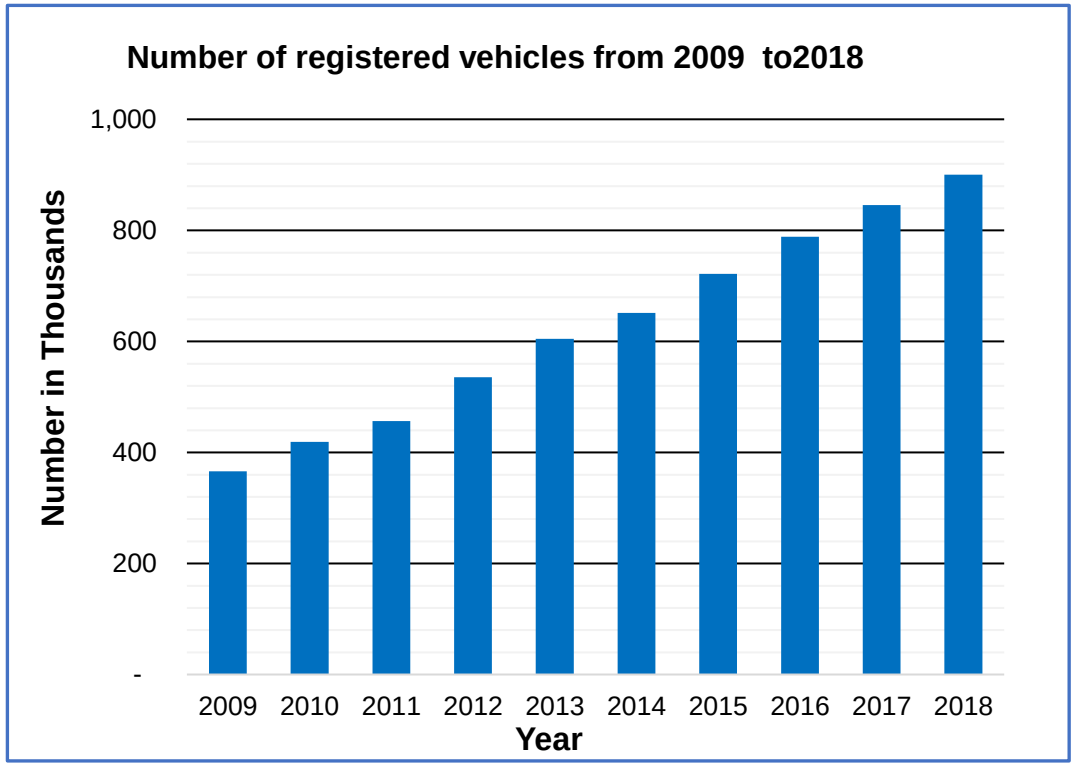
No	Airport Name	International	Domestic	Total
1	Wattay	1,726,967	551,639	**2,278,606**
2	Luang Prabang	501,733	262,030	**763,763**
3	Pakse	38,258	122,247	**160,505**
4	Savannakhet	7,284	21,256	**28,540**
5	Xiengkhouang	-	34,117	**34,117**
6	Oudomsay	-	47,949	**47,949**
7	Luang Namtha	-	56,861	**56,861**
8	Houay Xai	-	39,744	**39,744**
9	Xaignabouli	-	130	**130**
10	Phongsali	-	3,310	**3,310**
11	Xam Nuea	-	5,430	**5,430**
Total		**2,274,242**	**1,144,713**	**3,418,955**

Source: Department of Civil Aviation of Laos (2019)

BACKGROUND

- Besides the rapid increasing of its annual air passengers, the registered vehicles are also increased vastly in Vientiane with more than 10 percent of increase rate (2009 to 2018), and it reached more than 900 thousand in 2018 (Department of Transport, 2019).

- Therefore. The Vientiane will be seriously congested by road traffic near the future as well as the WIA.



Source: Department of Transport, Laos (2019)

BACKGROUND

Concept of VCAT

- **City Air Terminal of Vientiane (VCAT)** is expected to share a burden of road congestion and overcrowding of air passengers in airport terminal of the WIA.
- It is a mean of transportation mode that travels to and from the WIA by using **airport limousine bus** with its specific bus lane in traveling.
- The **flight check-in and immigration process of air passengers** would be included in services of the VCAT.

Source: Adapted from Google Earth.

RESEARCH OBJECTIVES, QUESTION and HYPOTHESES

❖ Research questions.

1) What are factors that influence on mode choices access the WIA?
2) How air passengers change their behaviors in choosing travel modes to the airport under the introduction of the City Airport Terminal in Vientiane Capital (VCAT).?

❖ Research hypotheses.

1) Air passengers' access mode choice would be affected by trip and socio-demographic characteristic variables.
2) The VCAT could change air passengers' behavior in choosing travel modes access to the WIA.

❖ Research objectives:

1) To investigate factors that influence on airport mode choice in accessing the WIA.
2) To investigate the factors shaping the access mode choice of air passengers in accessing the WIA under the introduction of the VCAT.

RESEARCH FLOW CHART

CONDUCTING A SURVEY to collect primary data

Location: Wattay International Airport, Laos.

Method: Paper-based distribution, face- to-face interview survey (both RP and SP).

DATA ANALYSIS to examine evidence:

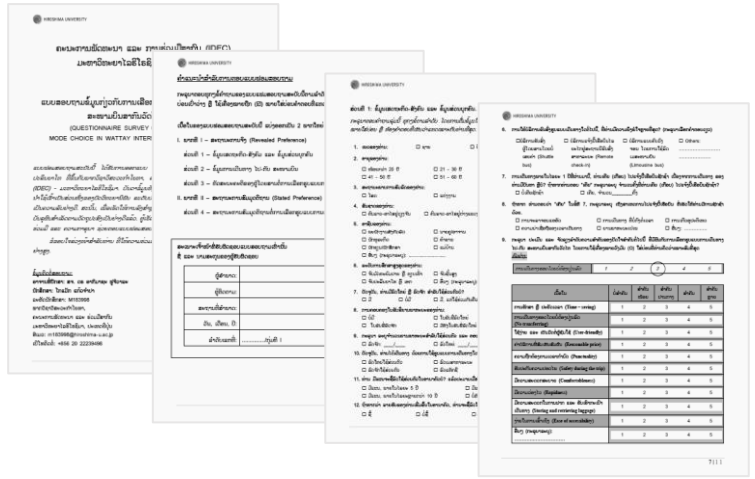
- Visualization data analysis.
- Constructing analytical model: MNL model.

RESULTS & POLICY SUGGESTION to take advantages of their impacts (if any).

QUESTIONNAIRE

The Revealed Preferences (RP) survey used to obtain data on actual behaviour of individuals that air passengers have currently accessed.

The Stated Preferences (SP) survey used to obtain behavioural data of air passengers when they are placed into hypothetical situations with some pre-established conditions.

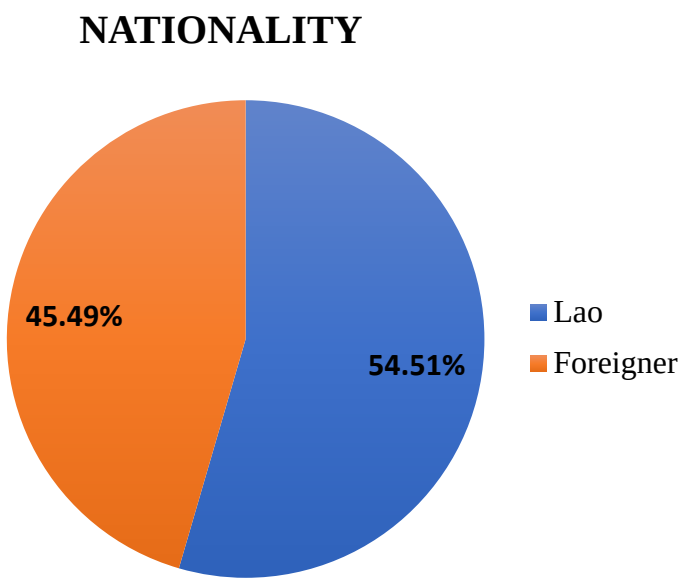


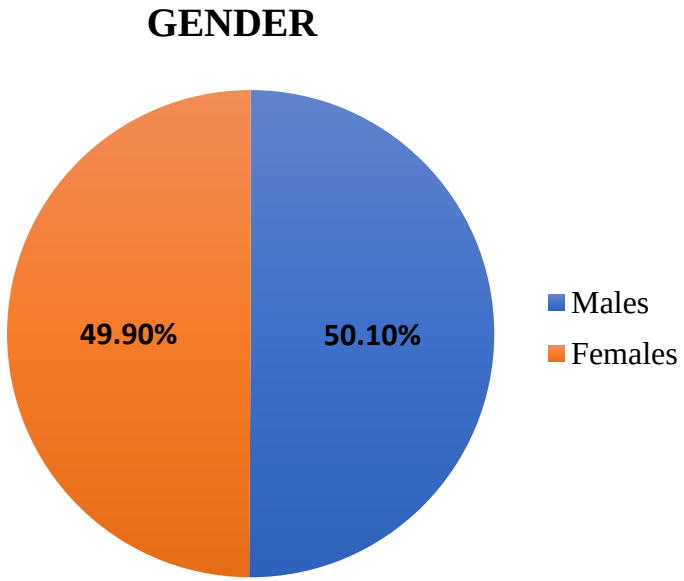
DATA SURVEY

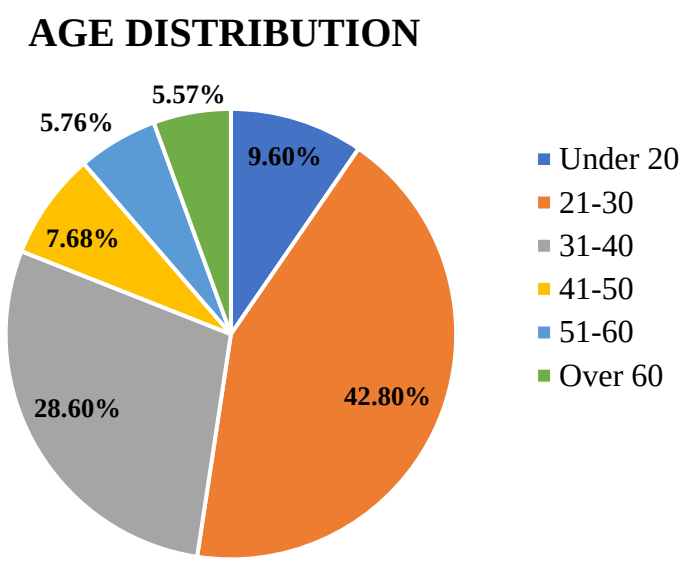
Type of Survey	Airport access mode choice survey.
Place	Wattay International Airport, Vientiane Capital, Laos.
Survey method	Paper-based distributed and face-to-face interview
Duration	October10th – November 15th, 2019
Target	400 air passengers in airport terminal (both international and domestic terminal buildings).

MAIN RESULTS-RP

Socio-demographic data





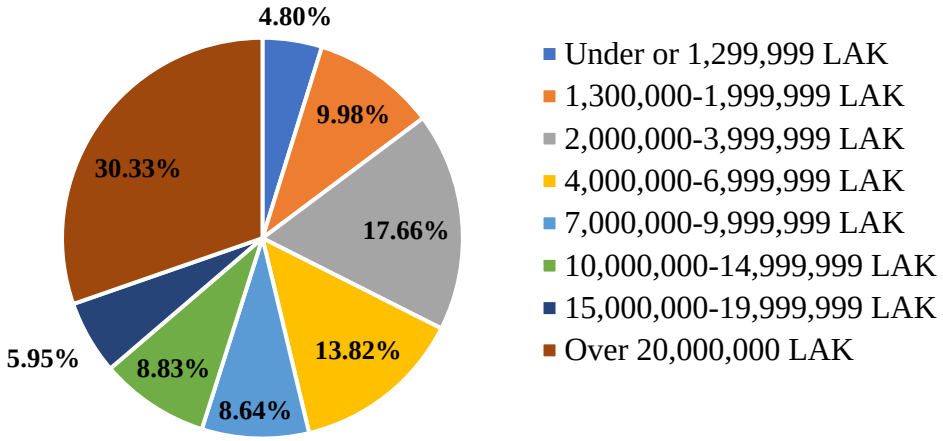


N= 521

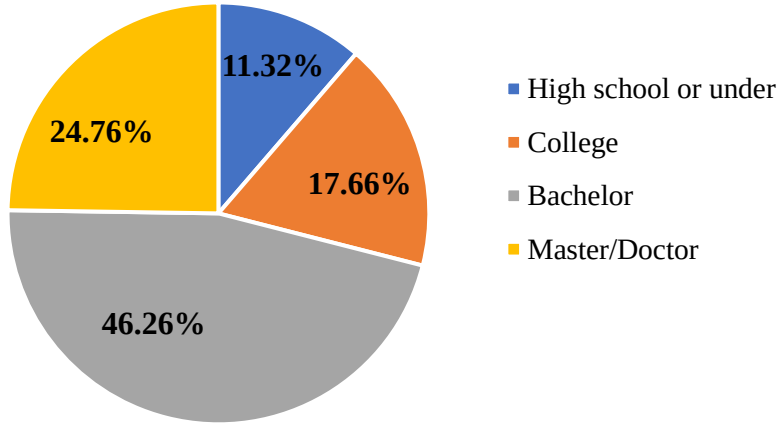
MAIN RESULTS-RP

Socio-demographic data

HOUSEHOLD INCOME

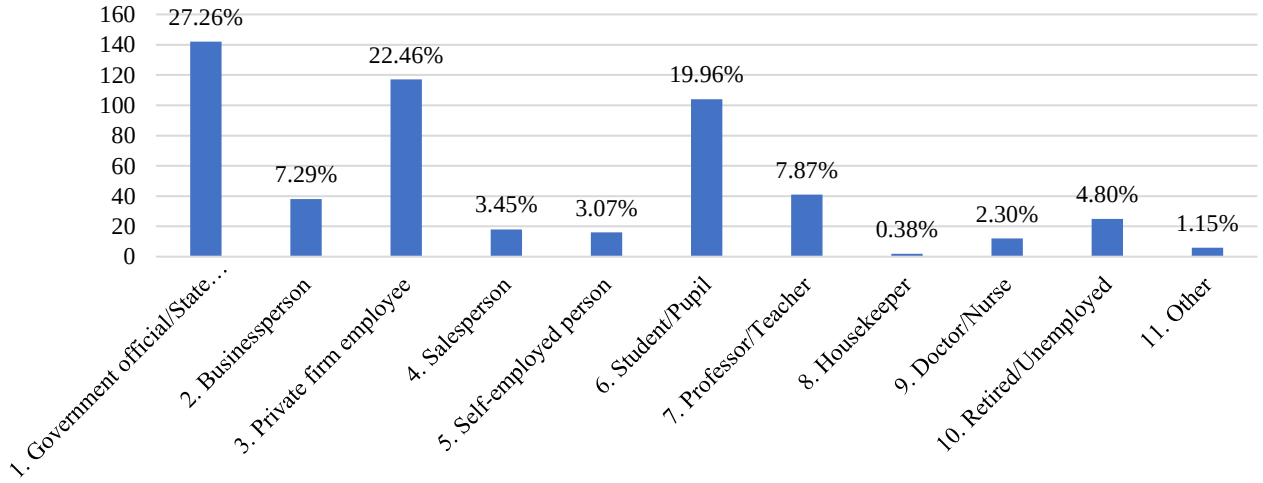


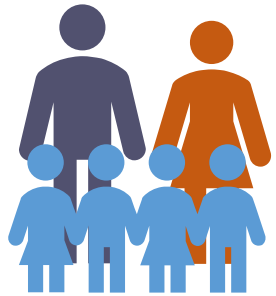
EDUCATION LEVEL



OCCUPATION

Unit: percent (%)





Household members

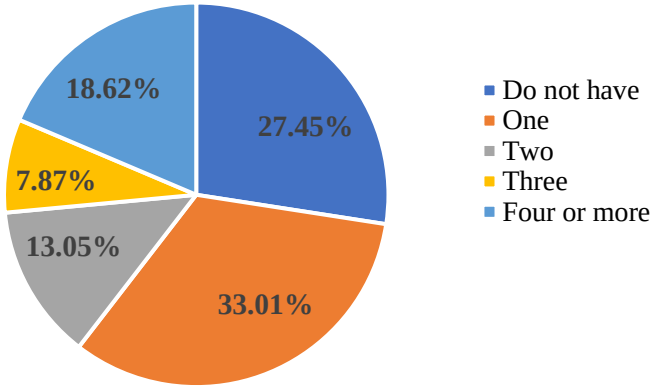
3.50

(average)

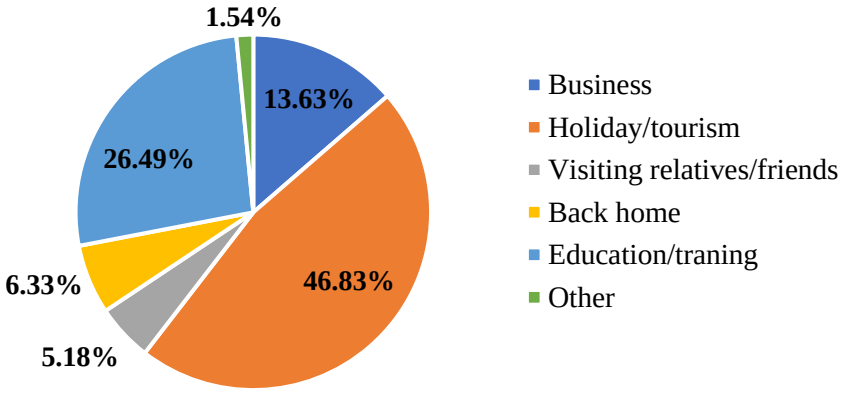
MAIN RESULTS-RP

Trip characteristic data

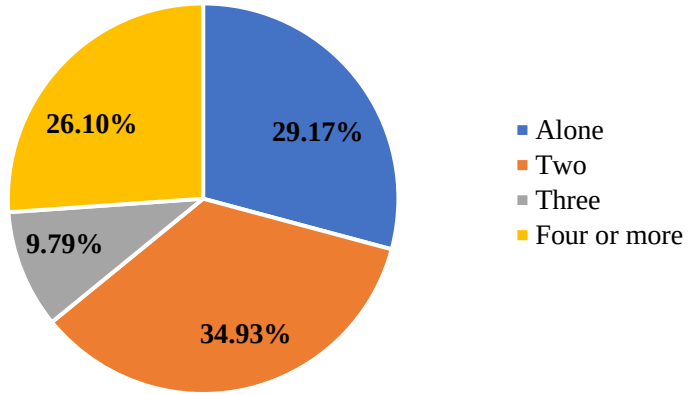
ACCOMPANYING



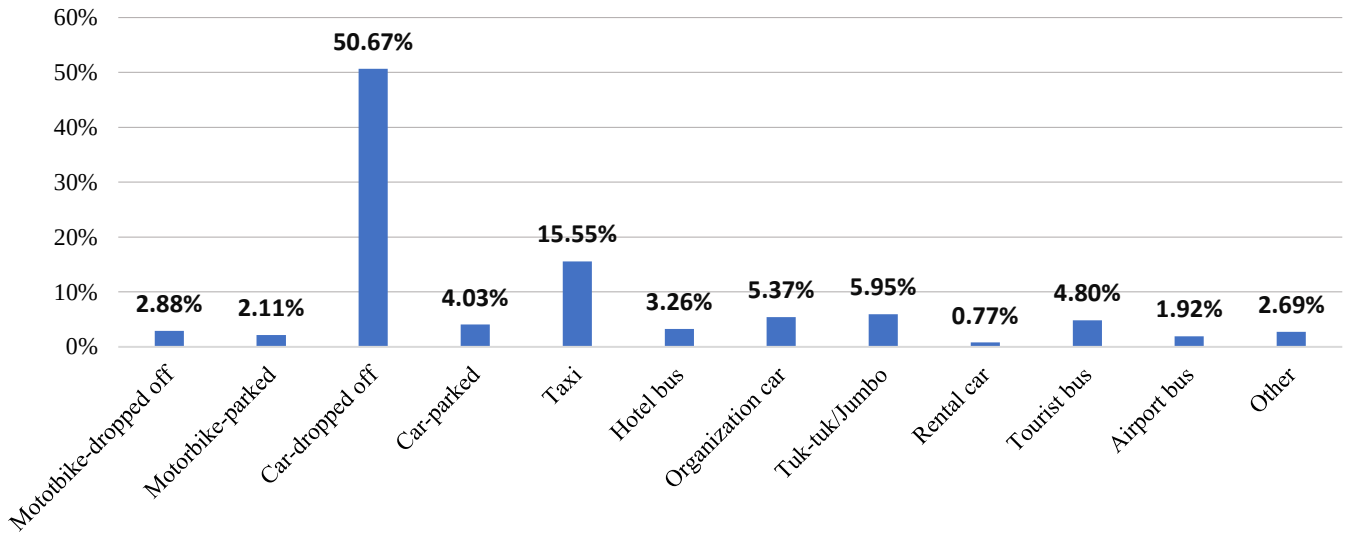
TRIP PURPOSE



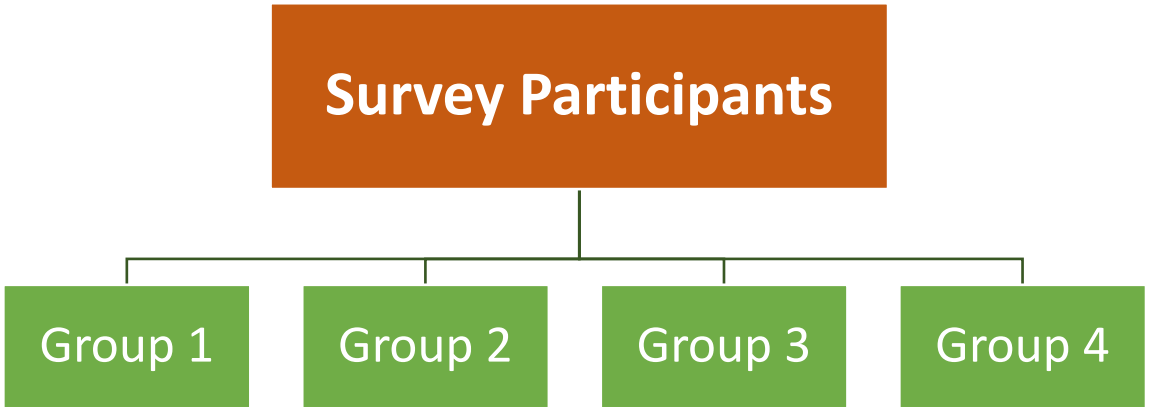
PARTY SIZE

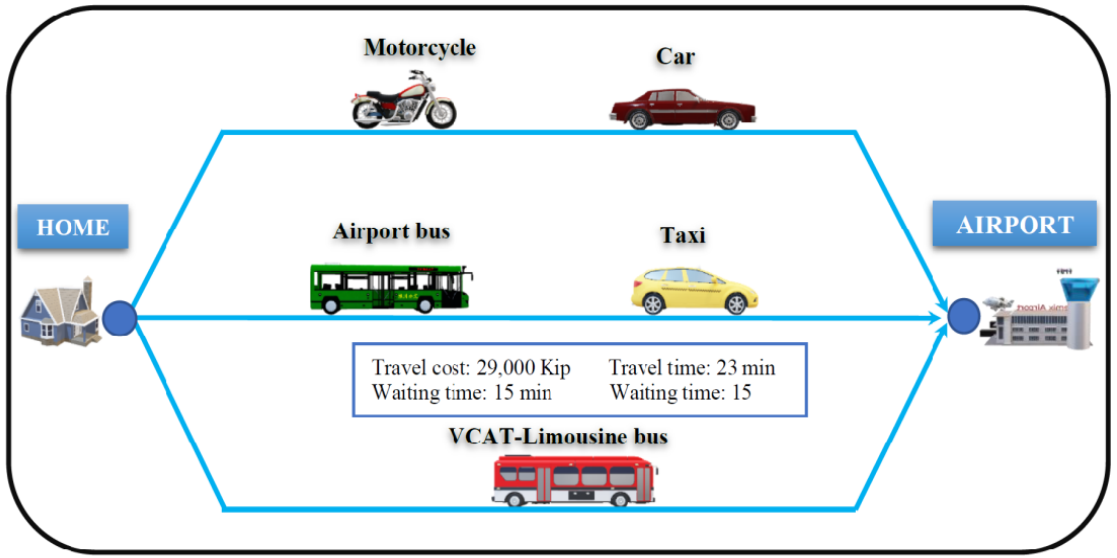


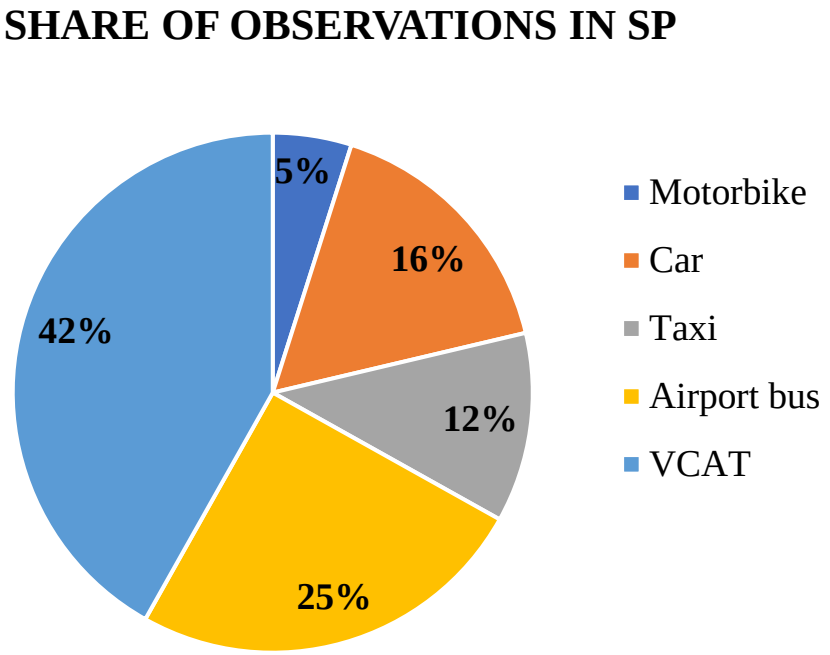
AIRPORT ACCESS MODE



MAIN RESULTS-SP







N= 1042

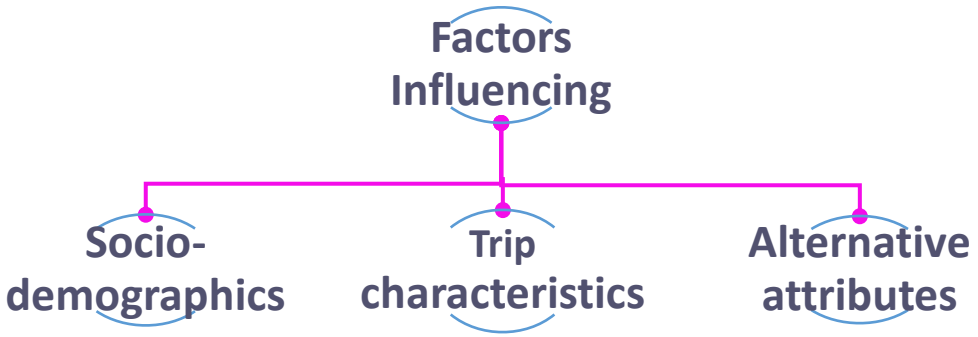
ANALYSIS

Multinomial Logit Model – Modelling airport access mode choice.

$$U_{in} = V_{in} + \varepsilon_{in}$$

$$Pr_{in} = \frac{\exp(V_{in})}{\sum_{j}^{N} \exp(V_{jn})}$$

U_{in} : is the utility obtained by air passenger (n) choosing mode(i).
Pr_{in} : is the probability that alternative (i) is chosen.
V_{in} : is utility function that air passenger (n) choosing mode (i)
V_{jn} : is utility function that air passenger (n) choosing mode (j)
ε_{in} : is a random component of utility(error term).
N: is the total number of alternatives available



No	Description	Detail and measurements
1.	Nationality	1=Foreigner; 0=Other
2.	Gender	1 =Male; 0=Other
3.	Age	1=<20; 2=21-30; 3=31-40 4=41-50; 5=51-60; 6> 60
4.	Occupation	1=Government employee; 2=Private employee; 3=Student; 4=Others
5.	Monthly household income (LAK)	1 =< 1,299,999; 2 = 1,300,000-1,999,999; 3 = 2,000,000-3,999,999; 4=4,000,000-6,999,999; 5 =7,000,000-9,999,999; 6 =10,000,000-14,999,999; 7 =15,000,000-19,999,999; 8 >20,000,000
6.	Vehicle ownership	Discrete variable
7.	Air class category	1= Economy class; 0=Other
8.	Frequency of travel per year	1= one time; 2= Two times; 3= Three times; 4= Four times; 5= Five times or over
9.	Accompanying traveler	1 = No accompanying traveler; 0=Others
10.	Trip purpose	1= Non-business; 0 = Other
11.	Check-in luggage	1=No luggage; 0 =Other
12.	Weather condition	1=Rainy; 0 = Other
13.	Travel cost	Discrete variable
14.	In-vehicle travel time	Discrete variable
15.	Delay time	Discrete variable
16.	Access time	Discrete variable
17.	Waiting time	Discrete variable
18.	Parking fee	Discrete variable
19.	Number of transfers	Discrete variable
20.	Safety margin	Discrete variable

ANALYSIS

Motorbike is reference mode

Explanatory variables	Car			Taxi			Bus			VCAT		
	Estimate	z-value	Signifi.	Estimate	z-value	Signifi.	Estimate	z-value	Signifi.	Estimate	z-value	Signifi.
Constant term	-3.05E-02	-5.5145	***	2.16E-05	0.0043		8.22E-03	1.828	+	2.06E-02	4.9631	***
Nationality	-1.11E-02	-1.5374		4.13E-04	0.0726		3.00E-03	0.5638		7.37E-03	1.4547	
Age	-8.24E-02	-6.5734	***	-4.62E-04	-0.013		2.53E-02	0.7324		5.29E-02	1.6098	
Gender	-1.60E-02	-3.6949	***	-9.91E-04	-0.1391		4.36E-03	0.6565		1.08E-02	1.7322	+
Occupation:												
- Government employee	-1.02E-02	-1.2441		1.59E-04	0.0201		2.64E-03	0.3626		6.90E-03	1.0182	
- Private employee	-5.60E-03	-2.7526	**	-3.69E-04	-0.1701		1.02E-03	0.4889		4.56E-03	2.3257	*
- Student	-5.76E-03	-3.3167	***	-1.68E-04	-0.078		1.49E-03	0.6556		4.14E-03	1.8167	+
Household income	-1.12E-01	-2.7749	**	4.02E-03	0.1218		3.39E-02	1.1036		7.13E-02	2.4651	*
Car ownership	-1.49E-02	-6.9794	***	2.44E-04	0.0839		4.57E-03	1.6595	+	1.01E-02	3.8377	***
Air class category	-2.89E-02	-5.3424	***	2.56E-04	0.0561		7.50E-03	1.8174	+	1.95E-02	5.0914	***
Frequency of traveler	-7.70E-02	-1.6889	+	1.84E-03	0.0475		2.17E-02	0.609		5.06E-02	1.5283	
Accompanying traveler	-1.37E-02	-3.6713	***	-1.65E-03	-0.4751		3.12E-03	0.989		1.02E-02	3.3742	***
Trip purpose	-1.47E-02	-5.9198	***	-1.07E-03	-0.367		4.92E-03	1.8514	+	9.73E-03	3.8733	***
Check-in luggage	-1.67E-02	-9.6335	***	-2.86E-04	-0.1598		4.16E-03	2.6647	**	1.19E-02	8.1337	***
Weather condition	-1.59E-02	-4.1824	***	1.85E-03	0.7714		4.38E-03	2.0495	*	9.74E-03	4.1932	***

Alternative Attributes	Estimate	z-value	Signifi.
Travel cost	1.24E-04	3.172	**
In-vehicle travel time	-1.80E-02	-0.4245	
Travel time reliability	2.73E-02	1.6446	+
Access time	-4.06E-02	-1.5410	
Waiting time	-5.97E-02	-2.1697	*
Number of transfer	-3.29E-03	-2.9614	**
Parking cost	8.37E-04	10.9824	***
Safety margin	1.43E-02	0.9488	

Initial log-likelihood : -1677.034
Final log-likelihood : -1242.417
McFadden Rho square : 0.256
Adjusted McFadden Rho square : 0.216

Significant codes: '***' < 0.001; '**'<0.01; '*'< 0.05; '+'<0.1

ANALYSIS

Highlights - Socio-demographics attributes

- Negative parameter for **Nationality** in private car accessing the airport, shows that Lao travelers are more likely to use private car, while foreign travelers tend to choose VCAT, bus and taxi accordingly.
- Negative parameter for **Gender** in private car and taxi accessing the airport, shows that female are more sensitivity to choose private car and taxi than male, while male tends to use VCAT and bus.
- Positive parameter for **Age** in Bus and VCAT accessing to the airport, shows that younger travelers are more likely to choose private car and taxi, while older travelers tend to use bus and VCAT.
- Negative parameter for **Occupation** in private car and taxi, shows that private employees and students are less sensitivity to choose private and taxi to access the airport, while government officials tend to use taxi, bus and VCAT.
- Positive parameter for **Household income** in private car, show that some air travelers with higher household income are more likely to choose taxi, bus and VCAT to the airport.
- **Car ownership**: shows that air travelers with no individual car are more likely to choose taxi, bus and VCAT to access the airport, while VCAT is high significant statistically.

ANALYSIS

Highlights - Trip characteristics attributes

- Negative parameter for **Air class category** in private car, show air travelers with economy class are less likely to use car, they tend to choose taxi, bus and VCAT to travel to the airport.
- Positive parameter for **Frequency of travel** in taxi, bus and VCAT, shows that air travelers with higher frequency of travel are less likely to use private to the airport.
- Positive parameter for **Accompanying traveler** in bus and VCAT, shows that air travelers with no one seeing them off at the airport are less likely to use private and taxi to access the airport.
- Negative parameter for **Trip purpose** in private car and taxi, shows that air travelers with business trip are more likely to use private car and taxi to travel to the airport.
- Positive parameter for **Check-in luggage** in bus and VCAT, shows that air travelers holding their check-in luggage are more likely to choose private car and taxi to access the airport.
- Negative parameter for **Weather condition** in private car, shows that air travelers tend to choose taxi, bus and VCAT to access the airport on rainy day.

ANALYSIS

Highlights – Alternative attributes

- Among the alternative attributes, **travel time, waiting time, access time and number of transfers** are negative parameters related to travel mode choice. The result show some of their effects have statistically significant impact on the utilization of alternatives. It means that the air travelers are the tendency to choose the travel modes that consider shorter travel time, less waiting time, and smaller access time as well as fewer number of transfers.
- Negative and positive parameter for **travel time and travel cost**, respectively. It means that air travelers are more sensitive with travel time than travel cost when choosing a mode of access to the airport. Moreover, **Access time and Waiting time** are negative parameters that influence on decision of air travelers in choosing a travel mode to the airport.
- The result also shows that the higher **delay time**, and higher **parking fee** at the airport the air travelers are less likely to use private car access to the port. They tend to choose taxi, bus and VCAT in accessing the airport.
- McFadden's **Rho-squared is 0.256**, which high enough to show the goodness of fit for the MNL model in the SP model.

FUTURE TASK

- **To do a discussion of research findings and summarize the results.**
- **To find and read papers related literature review.**

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THANK YOU FOR YOUR KIND ATTENTION