



## Effects of Pedicabs and Kuligligs on the Capacity of Roads in the Vicinity of De La Salle University

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## Background of the Study

### Kuliglig Dimensions



## Background of the Study

- These modes which are used for local service produce more traffic during school days because of the following behaviors:
  - counter flowing to the natural flow of vehicles
  - parked on the sides of the streets

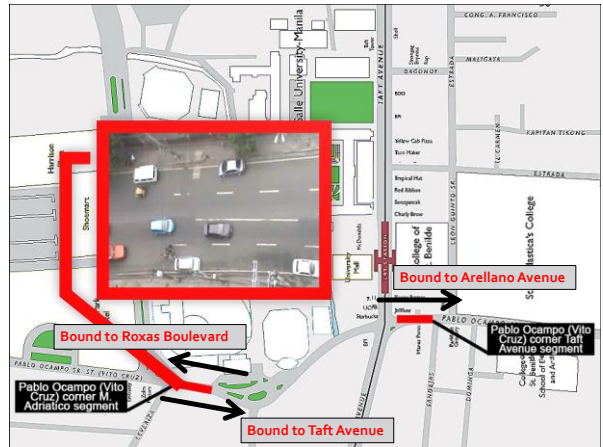


## Background of the Study

- Mayor Alfredo Lim banned kuligligs from the streets of Metro Manila
  - Due to the motors that kuliglig uses, which are not registered with the Land Transportation Office
  - Gas emissions violate the Clean Air Act
- Effective date of ban:
  - December 1, 2010



## Map of the Study Area



## Problem Setting

- Pedicabs and kuligligs mainly contribute to the traffic congestion because of their behavior in the road
- Traffic flow is greatly affected by the following:
  - pedicabs and kuligligs that counter flow with the natural flow of vehicles
  - slow speed of pedicabs and kuligligs
  - parked pedicabs and kuligligs along the sides of the road



## Objectives of the Study

To determine the impact of pedicabs and kuligligs on vehicular flow along road sections in the vicinity of De La Salle University

The specific objectives of the study are:

1. To determine the speed characteristics of pedicabs, kuligligs and passenger cars along road sections observed.



## Objectives of the Study

- To determine and compare the effect of pedicabs and kuligligns on vehicular speeds and flows along road sections observed.
- To determine the operating characteristics of pedicabs and kuligligns and the socio economic profile of pedicab and kuliglign drivers that provides service in the vicinity of DLSU.
- To determine the opinion of commuters about pedicab and kuliglign service.

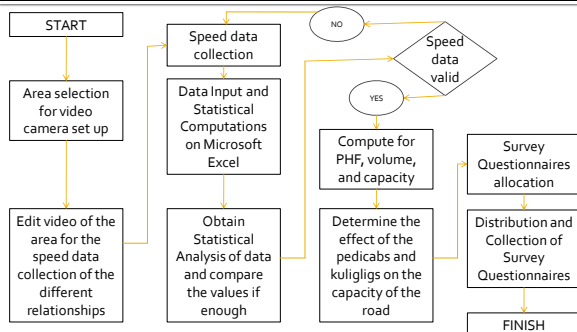


## Limitations of the Study

- Considered video footages of the traffic flow during the morning of weekdays only
- Vehicle count is limited to 3 hours per area observed
- The participants who answered the survey are limited to pedicab and kuliglign users and drivers
- Did not consider the effect of the one-way flow and the counter flowing of pedicabs and kuligligns



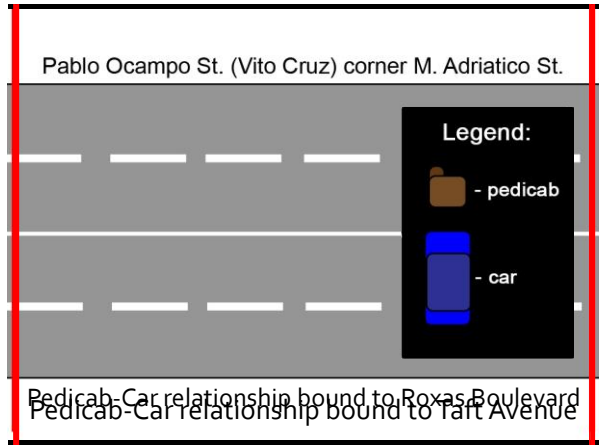
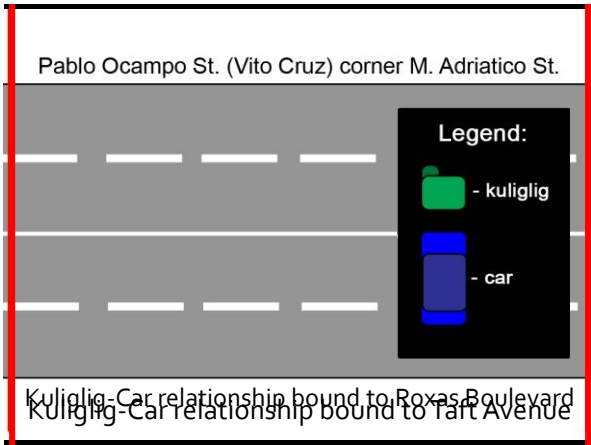
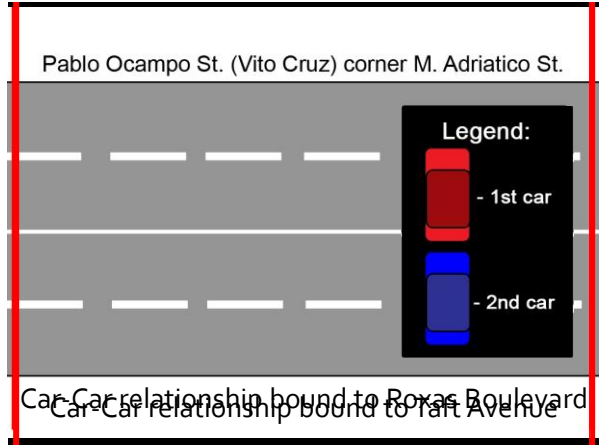
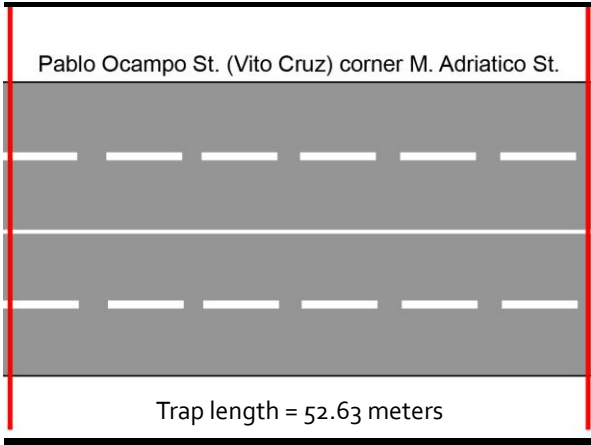
## Methodology

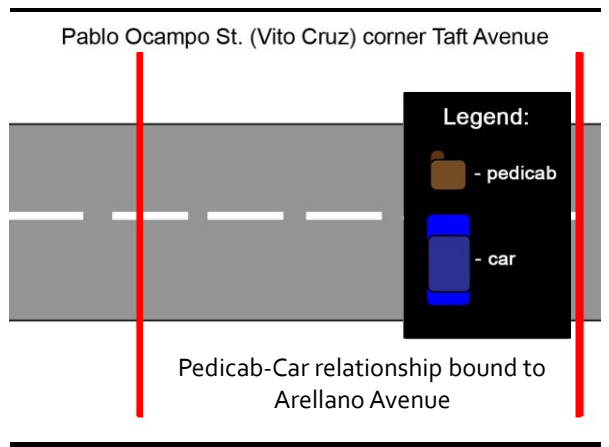
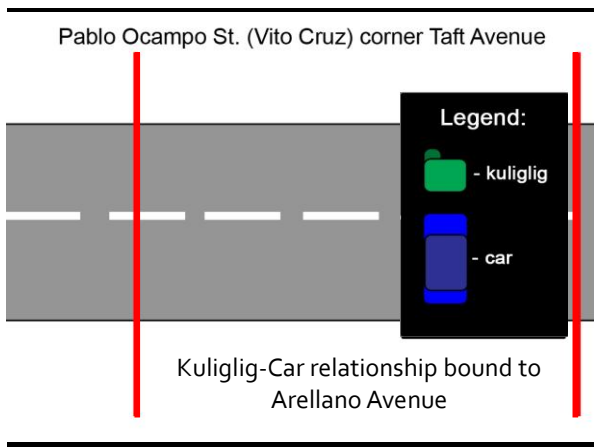
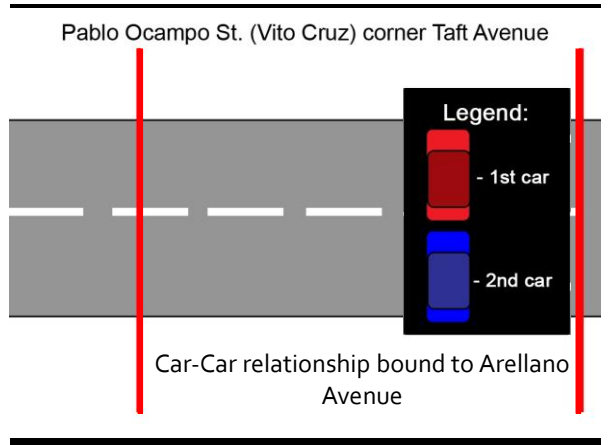
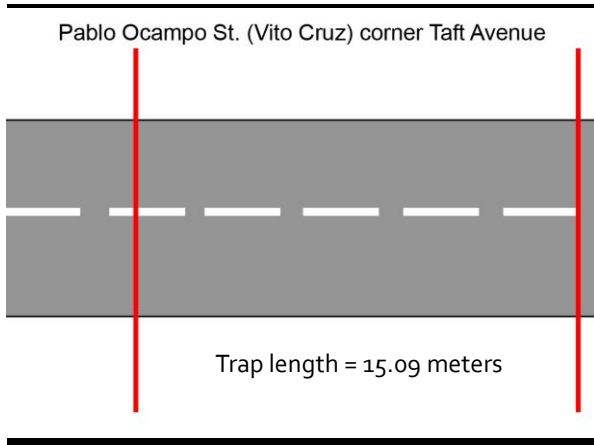


## Methodology

- The impact of pedicabs and kuligligns on private vehicles along the study area were obtained through the following relationships







## Methodology

- The impact of pedicabs and kuligligs users and drivers along the study area were obtained through 2 sets of survey questionnaires



## Presentation and Analysis of Data



## Survey Questionnaire

- The group conducted 2 sets of survey concerning the following:
  - Pedicab and Kuliglig Users
  - Pedicab and Kuliglig Drivers
- Results of Survey :
  - Opinions of commuters about pedicab and kuliglig service
  - Operating characteristics of pedicabs and kuligligs
  - Socio economic profile of pedicab and kuliglig drivers that provides service in the vicinity of DLSU

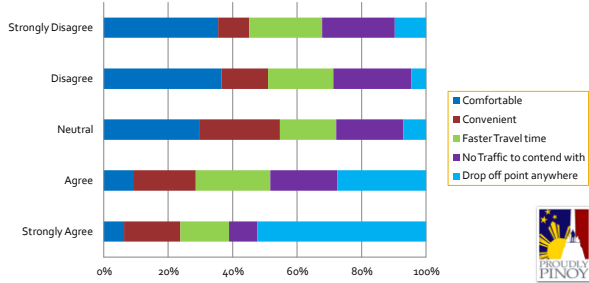


## Pedicab and Kuliglig Users



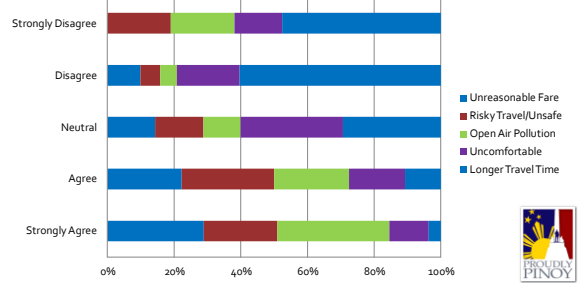
## Pedicab and Kuliglig Users Results

- Best Advantage
  - Ability to be dropped off anywhere

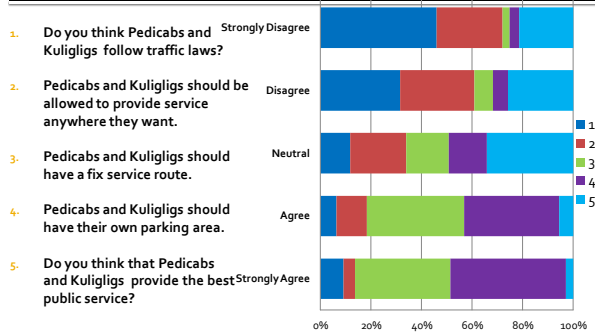


## Pedicab and Kuliglig Users Results

- Worst Disadvantages
  - Open Air Pollution, Risky travel and Unreasonable Fare



## Opinion of Users



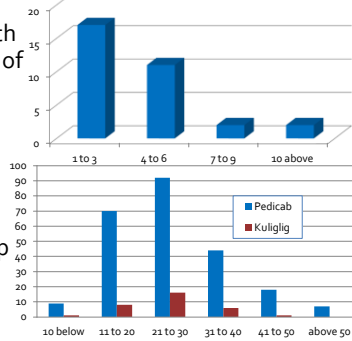
## Pedicab and Kuliglig Drivers

### Pedicab and Kuliglig Drivers



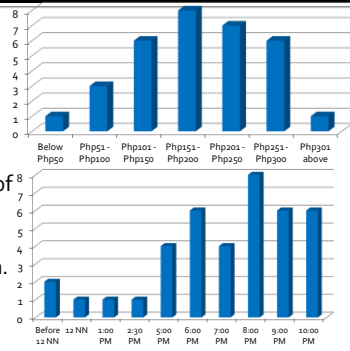
## Pedicab and Kuliglig Drivers Results

- Has a family with an average size of 4 members to support
- Receives an average fare of 20 pesos per trip



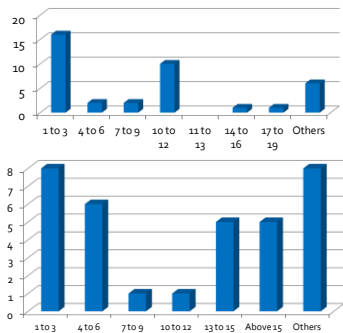
## Pedicab and Kuliglig Drivers Results

- Earns on average 151 to 200 pesos daily
- Works an average of 14 hours a day starting from 6am and ending at 8 pm.



## Pedicab and Kuliglig Drivers Results

- Average of 10 trips a day
- Provide service to an average of 4 to 6 passengers a day



Video Analysis for Two-way Flow (with Kuligligs)



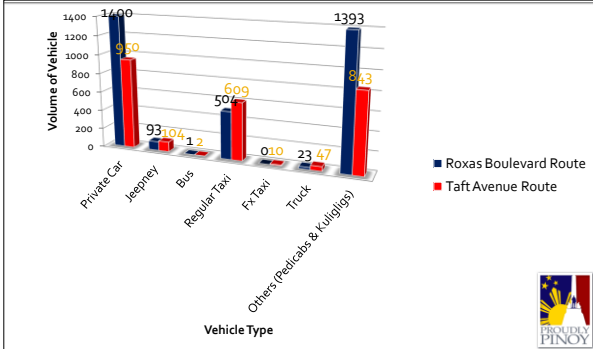


## Video Analysis for Two-way flow (with Kuligligs)

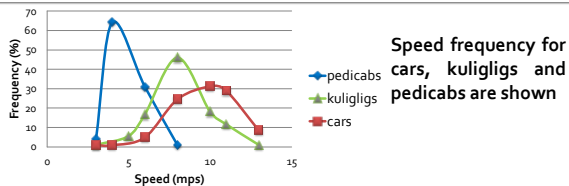
- To be able to determine the effect of pedicabs and kuligligs to the capacity of road segments of the study area, the following were obtained:
  - Vehicular volume per hour with 15 minutes of interval
  - Speed data of cars, kuligligs and pedicabs
  - Speed data of car-car, kuliglig-car and pedicab-car relationships



## Total Vehicular Volume Bound to Roxas Boulevard and Taft Avenue



## Speed Distribution of Target Vehicles to Roxas Boulevard

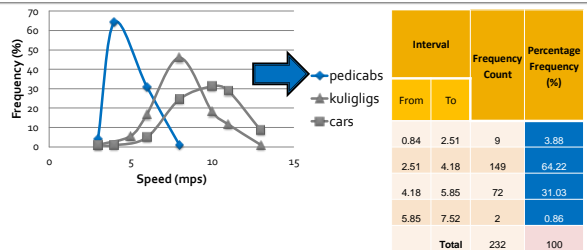


Relationship	% Frequency	Average Speed (mps)	Average Speed (kph)
Car	224	9.03	32.49
Kuliglig	198	7.40	26.63
Pedicab	232	3.91	14.06

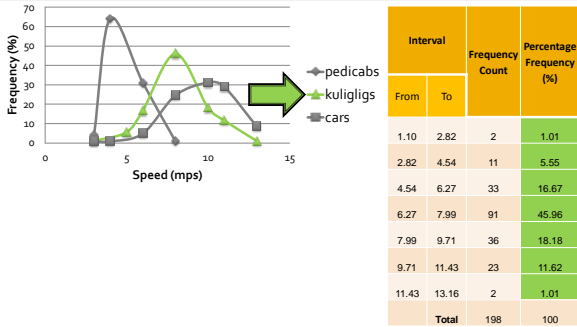
The average speeds of cars, kuligligs and pedicabs are shown



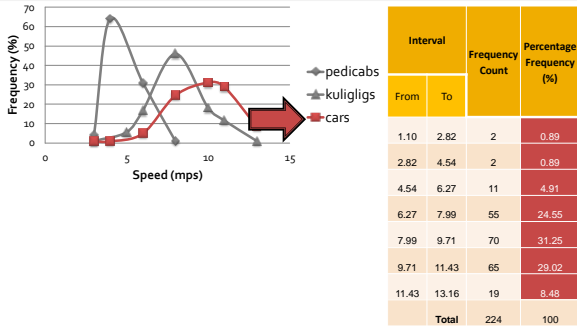
## Speed Distribution of Target Vehicles to Roxas Boulevard



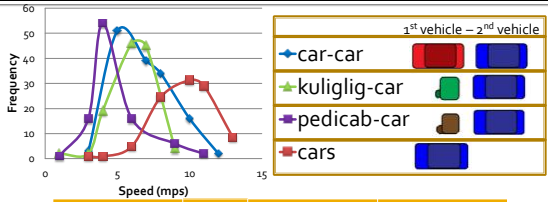
## Speed Distribution of Target Vehicles to Roxas Boulevard



## Speed Distribution of Target Vehicles to Roxas Boulevard



## Speed Distribution in Pablo Ocampo Bound to Roxas Boulevard



Relationship		Count	Average Speed (mps)		Average Speed (kph)	
1 <sup>st</sup> Vehicle	2 <sup>nd</sup> Vehicle		1 <sup>st</sup> Vehicle	2 <sup>nd</sup> Vehicle	1 <sup>st</sup> Vehicle	2 <sup>nd</sup> Vehicle
car	car	147	7.69	7.84	27.69	28.21
pedicab	car	97	3.93	5.94	14.14	21.40
kuliglig	car	119	6.76	6.72	24.33	24.19



## F-test and T-test

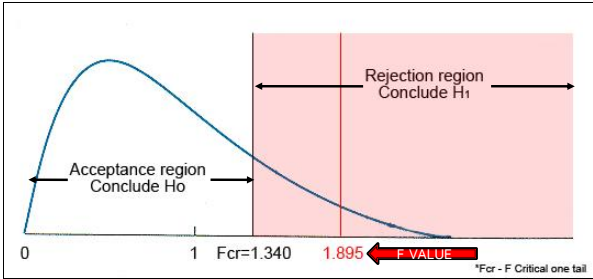
The F-test is used to test for differences among equal or unequal variances

The T-test is used to test the average speed difference

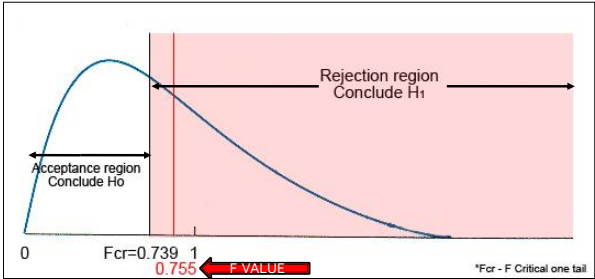
- Null hypothesis –  $H_0: \mu_1 = \mu_2$
- Alternative hypothesis –  $H_1: \mu_1 \geq \mu_2$



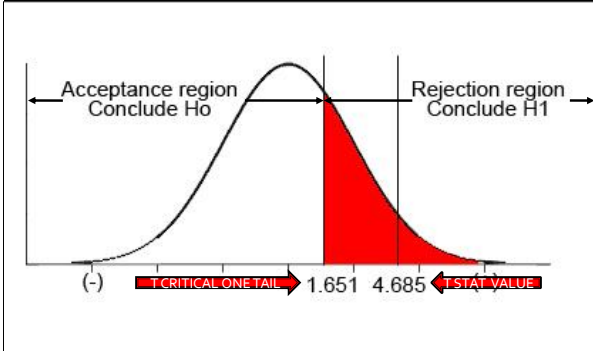
### F-test Curve for Car-Car and Kuliglig-Car for Lane to Roxas Boulevard



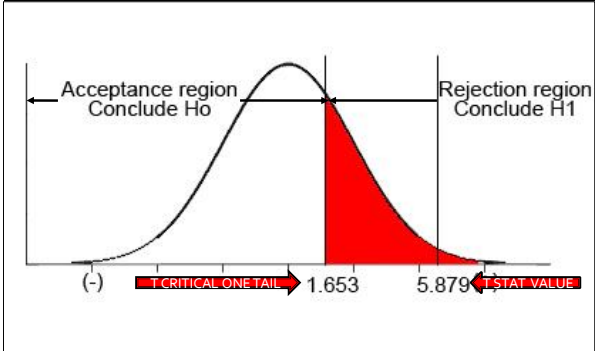
### F-test Curve for Car-Car and Pedicab-Car for Lane to Roxas Boulevard



### T-test Curve for Car-Car and Kuliglig-Car for Lane to Roxas Boulevard



### T-test Curve for Car-Car and Pedicab-Car for Lane to Roxas Boulevard



## Summary of Vehicles to Taft Avenue

SPEED DISTRIBUTION OF TARGET VEHICLES

Relationship	Frequency	Speed (mps)	Speed (kph)
Car	29	5	18
Kuliglig	39	8	28.8
Pedicab	68	6	21.6
Car-Car	58	6	21.6
Kuliglig-Car	14	4	14.4
Pedicab-Car	10	3	10.8

F AND T-TEST RESULTS OF TARGET VEHICLES

Relationship	F-Test		T-Test	
	F	Fcr	T stat	Tcr
Car-Car and Kuliglig-Car	2.271	1.673	1.985	1.665
Car-Car and Pedicab-Car	4.926	2.344	8.285	1.701



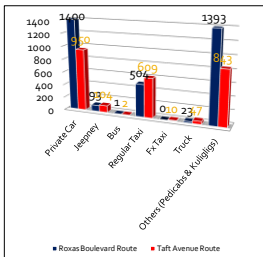
## Video Analysis for Two-way Flow (without Kuligligns)

Video Analysis for Two-way Flow (without Kuligligns)

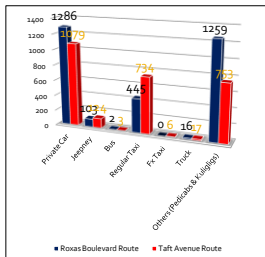


## Total Vehicular Volume Comparison

TWO-WAY FLOW WITH KULIGLIGS



TWO-WAY FLOW WITHOUT KULIGLIGS



## Summary of Speed Distribution of Target Vehicles and their Relationships

SPEED DISTRIBUTION WITH KULIGLIGS BOUND TO ROXAS BOULEVARD

Relationship	Frequency	Speed (mps)	Speed (kph)
Car	70	10	36
Kuliglig	91	8	28.8
Pedicab	149	4	14.4
Car-Car	52	7	25.2
Kuliglig-Car	47	7	25.2
Pedicab-Car	54	4	14.4

SPEED DISTRIBUTION WITHOUT KULIGLIGS BOUND TO ROXAS BOULEVARD

Relationship	Frequency	Speed (mps)	Speed (kph)
Car	49	7	25.2
Pedicab	52	4	14.4
Car-Car	51	6	21.6
Pedicab-Car	52	6	21.6

SPEED DISTRIBUTION WITH KULIGLIGS BOUND TO TAFT AVENUE

Relationship	Frequency	Speed (mps)	Speed (kph)
Car	29	5	18
Kuliglig	39	8	28.8
Pedicab	68	6	21.6
Car-Car	58	6	21.6
Kuliglig-Car	14	4	14.4
Pedicab-Car	10	3	10.8

SPEED DISTRIBUTION WITHOUT KULIGLIGS BOUND TO TAFT AVENUE

Relationship	Frequency	Speed (mps)	Speed (kph)
Car	46	6	21.6
Pedicab	90	3	10.8
Car-Car	118	4	14.4
Pedicab-Car	18	3	10.8

## Summary of F and T-tests of Target Vehicles and their Relationships

FAND T-TEST RESULTS WITH KULIGLIGS  
BOUND TO ROXAS BOULEVARD

Relationship	F-Test		T-Test	
	F	Fcr	T stat	Tcr
Car-Car and Kuliglig-Car	1.895	1.340	4.685	1.651
Car-Car and Pedicab-Car	0.755	0.739	5.879	1.653

FAND T-TEST RESULTS WITH KULIGLIGS  
BOUND TO TAFT AVENUE

Relationship	F-Test		T-Test	
	F	Fcr	T stat	Tcr
Car-Car and Kuliglig-Car	2.271	1.673	1.985	1.665
Car-Car and Pedicab-Car	4.926	2.344	8.285	1.701

FAND T-TEST RESULTS WITHOUT KULIGLIGS  
BOUND TO ROXAS BOULEVARD

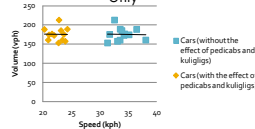
Relationship	F-Test		T-Test	
	F	Fcr	T stat	Tcr
Car-Car and Pedicab-Car	2.692	1.394	4.078	1.656

FAND T-TEST RESULTS WITHOUT KULIGLIGS  
BOUND TO TAFT AVENUE

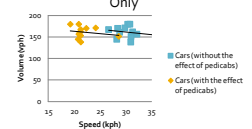
Relationship	F-Test		T-Test	
	F	Fcr	T stat	Tcr
Car-Car and Pedicab-Car	1.094	1.722	1.558	1.654

## Summary of Speed-Volume Relationships for Two-Way Flow

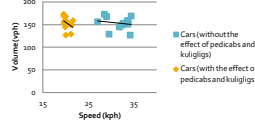
Two-Way Flow w/ Kuligligs for Cars Only



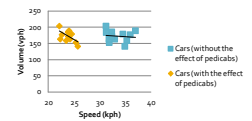
Two-Way w/o Kuligligs Flow for Cars Only



Two-Way Flow w/ Kuligligs for Cars with the Effect of Pedicabs and Kuligligs



Two-Way Flow w/o Kuligligs for Cars with the Effect of Pedicabs



## Summary of Findings

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- The study was able to obtain the opinion of commuters regarding pedicab and kuliglig services.
- Based on the survey, commuter opinions confirm the fact that pedicabs and kuligligs are one of the reasons for traffic congestion in Metro Manila.
- The study was able to obtain the operating characteristics of pedicabs and kuligligs within the area.



## Summary of Findings

- The study was able to obtain different speed figures of pedicabs, kuligligs and cars on a two-way and one-way traffic flow condition on road segments in Metro Manila
- The speed values for a car trailing a pedicab was determined to have the lowest speed in comparison with a car trailing a kuliglig and a car trailing another car



## Conclusions



## Conclusions

- The capacity of a mixed traffic flow is complex
- There was a decreased in the speed of cars trailing both pedicabs and kuligligs
- The volume for the road sections observed increased
- Speed-volume relationship was satisfied

