Analysis of Mode Switching Behavior of PUP Main Campus Students to Pasig River Ferry Service

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Abstract: Issues on the low volume of passengers on the Pasig River Ferry Service were seen alarming. So far, considerable post-evaluation studies on the impact of Pasig River Ferry Service on the riding public have not yet been undertaken. This paper therefore attempts to clarify the significant factors affecting the common public passengers' mode switching behavior, in this case for PUP Students, considering the post-Pasig River Ferry Service scenario. The results of the study shows that Awareness and Interest are the two major factors which have a significant have influence over the mode switching decision of PUP Students to Pasig River Ferry Service. As for the factor Interest, there are sub-factors which independently have influence to it. These sub-factors are Accessibility of the Stations, Affordability, Frequency of Service, In-vehicle Travel Time, Comfort and Passengers' Satisfaction with current mode. The Study also investigates the switching percentage in terms of Time and Cost. The switching percentage estimation is carried out using Microsoft Excel 2007 and using its math and logic functions, a simulation program was created in order to determine the headway interval and fare cost which can be best suited with the students' travel characteristics. As from the results of the simulation, the present headway interval of thirty (30) minutes and present discounted fare cost for students of Twenty (20) Pesos seems to be ineffective which is proven by low switching percentage. The Ten (10) minutes Headway Interval and Ten to Fifteen (10-15) Pesos fare cost got the best results of switching percentage.

1. INTRODUCTION

1.1 Background

Metro Manila urban transportation highly depends on road-based transportation; however this had almost reached its maximum limit. Roads became too overcrowded due to the increased volume of vehicles caused by great travel demand in the city.

In order to compensate this situation, the government introduced schemes that will somehow reduce the effects of congestion.

Introducing new transportation systems is one option the government chose. Mass Rail Transport System has been introduced. Later, the government takes advantage of the inland waterway located within the city and therefore reviving a ferry service on Pasig River. This transport system generally benefits the riding public specially PUP Students wherein PUP is located near the banks of the river.

However, there are reports of low passenger volume. The determination of such factors that affects the passenger volume of Pasig River Ferry Service can be a big help in creating appropriate measures to effectively deals with problem.

1.2 Objectives

a. To determine the Trip Characteristics of PUP Students.
b. To determine and explain the factors that influenced PUP student's mode switching decision to Pasig River ferry for Home-to-School Trip
c. To generate a model that will represent the switching behavior of PUP Students to Pasig River Ferry Service.

1.3 Scope and Limitations

The study focuses its attention on the analysis of mode switching behavior of Polytechnic University of the Philippines (PUP) Students towards Pasig River Ferry Service. Here are the scopes of the study:

- The study is a Morning Home-to-School type of trip
- The study's gathered data are from the students' travel characteristics from second semester of School Year (S.Y) 2008-2009
- Only students of PUP Main Campus were surveyed
- A random survey of students is done and students were given survey questionnaire regardless of their origin (ex. City of origin) but the primary data that used for the study came from students residing from these cities:
  - ➢ Pasig City
  - ➢ Makati city
  - ➢ Mandaluyong City
  - ➢ Manila City
- Mabini Campus (Main Campus Building) is the survey site for the study
- A questionnaire checklist survey is used as the survey material
- The day of survey is taken out during schooldays
- Variables Time and Cost is the primary subject for the study

Here are the limitations of the study:
- Morning to-school trip is the only trip type tackled in the study
- Variables travel Time and Cost are the only service characteristics fully tested in the study
- There are only Two Case Scenarios tested in the study.

  CASES A SCENARIO:
  Total Travel Time: Pasig River Ferry < current mode of transport
  Total Travel Cost: Pasig River Ferry > current mode of transport

  CASES B SCENARIO:
  Total Travel Time: Pasig River Ferry > current mode of transport
  Total Travel Cost: Pasig River Ferry < current mode of transport

2. METHODOLOGY

2.1 The Study Area and the Survey Site

The four major cities under the influence of Pasig River as well as for the Ferry Service were chosen. These include the cities of Manila, Mandaluyong, Makati and Pasig. The respondents' travel characteristics are based on their city of origin.

As for the Survey Site, PUP Mabini Campus or the Main Campus was chosen.

2.2 The Population and the Respondents

PUP Student Population was used. There is a total of 25, 038 students used as the population frame wherein researchers excluded the colleges outside the main campus. Using Sloven's Formula, the researchers rendered a total of 394 students as the target sample size.

2.3 The Survey Instrument and Design

The researchers utilized the combination of Questionnaire checklist and Stated Preference Questionnaire Survey Method to gather the needed data. The questionnaires used in this study are designed to consist of (3) parts such as:

1) Personal and Socio-Economic Characteristics
2) Travel characteristics
3) Perception and Stated Preference Survey

2.4 Survey Methodology

These are the steps that the researchers followed in gathering the data for the study.
1) Determination of survey sites
2) Determination of the number of respondents
3) Questionnaire construction for pilot testing
4) Questionnaire Validation
5) Construction of final questionnaire
6) Distribution of the survey questionnaire to the respondents

The survey instruments are distributed by the researchers personally at the selected survey sites. The days of data collection are during schooldays. The survey was continued until the desired numbers of respondents are obtained. At each survey site, the questionnaires were given randomly.

7) All the copies distributed was then retrieved by the researchers immediately after the respondent answers the questionnaire.

2.5 Simulation Methodology

The estimation process utilized Microsoft Excel 2007 using its logical function wherein a simulation program is created. Variables Time and Cost is the focus of the estimation. Also, there are several assumptions that were followed and these include the following:

1) Estimated Ferry Service speed is still the same at 12.5 knots (23 kph)
2) Ferry Service Boat capacity is still the same at 150 seaters
3) The frequency of service vary from 10 to 30 minutes
4) The fare cost vary from 10 to 20 Pesos

Several scenarios are tested to come up with a model that will represent the switching percentageof PUP Students to Pasig River ferry in terms of Time and cost.

Scenario 1: Pasig River Ferry Service with 12.5 knots (23 kph), 150 seater boats, **10 minutes Headway Interval**, fare cost vary from 10 to 20 Pesos with Willingness to Pay scenario, Case A and Case B.

Scenario 2: Pasig River Ferry Service with 12.5 knots (23 kph), 150 seater boats, **20 minutes Headway Interval**, fare cost vary from 10 to 20 Pesos with Willingness to Pay scenario, Case A and Case B.

Scenario 3: Pasig River Ferry Service with 12.5 knots (23 kph), 150 seater boats, **30 minutes Headway Interval**, fare cost vary from 10 to 20 Pesos with Willingness to Pay scenario, Case A and Case B.

Here are the lists of variables that are used as input data:
- Total Travel Cost of a respondent by using his current mode
- Total Travel Time of a respondent by using his current mode
- Case scenario data
- Estimated Total Travel cost by using Pasig River Ferry Service
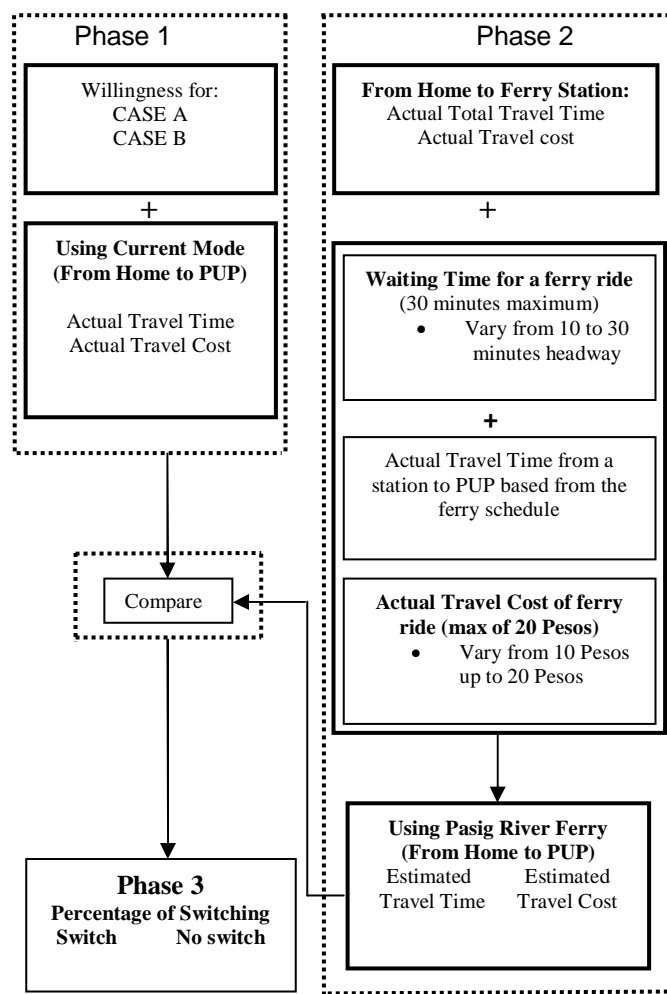- Estimated Total Travel Time by using Pasig River Ferry Service

Figure 1 Simulation Framework for the analysis of switching behavior.

The Simulation Process is divided into Three Phases with completely different procedures each. The Phases are briefly described below.

- Phase1- the estimation of the Total Travel Time and cost of a respondent by using his current mode of transportation
- Phase2- The estimation of the Total Travel Time and cost of a respondent by using Pasig River Ferry Service.
- Phase3- The comparison of the Total Travel Time and Cost between by using current mode and by using Pasig River Ferry Service to get the switching estimates.

3. RESULTS AND ANALYSIS

3.1 Profile of Samples

The respondents are generally young, with about 24.26% in the 17 years old bracket. Gender Distribution is almost evenly distributed with the shares of females slightly above at 58.06% as that of males at 41.95%.

3.2 Trip Characteristics of PUP Students

An average PUP Student had a daily allowance of 80 to 120 pesos. These students generally belong to middle to low income class of family. Most of the respondents (79.41%) are going to school four to six times in a week and also most of these students (48.14%) are leaving home before 7:00 in the morning. The mode which is the most used by PUP students when travelling to school is the Public Utility Jeepney (PUJ). The students with the highest travel cost are from Cavite (57.00 Pesos) while the lowest travel costs are from students coming from Manila City (9.51 Pesos). Students who had the longest travel from their home up to PUP are the students coming from Cavite (188 minute) while the shortest are coming from Manila City (39.4 minutes).

3.3 Awareness and Satisfaction to Pasig River Ferry Service

Majority of the respondents knows that the Pasig River Ferry Service exist but most of them are not taking it. There are 51.2% of students who know a near Pasig Ferry Station near their home but only 47.68% out of this percentage are taking ferry boat rides. Ferry Stations seems to have a significant distance to the origin of the students since most of them (57.15%) first need to take a ride, jeepney ride to be specific in order to arrive at the station. These students who are using PRFS said that they are satisfied with its services and comfort is the most satisfying service that PRFS provide and waiting time is the most dissatisfying service characteristic of PRFS.

3.4 Willingness to Switch

Students were asked about their willingness to switch to PRFS. There are a nearly equal percentage of students who are willing (43.4%) and those who are not willing to switch (56.7%).

Students who are willing to switch are asked about their preferences in order for them to switch to PRFS. Students of PUP stated that a shorter travel time, less expensive fare and easily-accessible stations are the very important services that the ferry service should provide to get their interest to switch as shown in Table 1.

Students who are not switching and don't have an interest to switch to Pasig River Ferry Service were asked about their reasons behind their decision for not switching. Majority of the students said that there is no Pasig River Ferry Service near to their home, the fare is too much expensive, waiting time is too long and that they are still satisfied with their current modes of transport for not having an interest to switch to PRFS as shown in Table 2.

3.5 PUP Students' Perception on Pasig River Ferry Service

Fare Cost

The respondents were asked about their perception on the present student's fare of Twenty Pesos (20.00). As a result, 50.6% said that they are agreeing while the other 49.4% do not agree to the said fare.

Waiting Time

The respondents were also about their perception to the present headway interval of Thirty minutes (30 min). As a result, a surprising 80.4% said that they do not agree and the other 19.6% said that the present waiting time is okay.

3.6 Willingness to Sacrifice

There are two sets of Case Scenario tested in the study. Case A Scenario which involves Travel Time reduction for Travel Cost increase and Case B Scenario which deals with Travel Time increase but in return, there will be a Travel Cost reduction.

For Case A Scenario, most of the students (58.34%) are only willing to have a five minute Travel Time decrease for a Three Pesos increase in travel cost.

For Case B Scenario, most of the students (59.53%) are only willing to have a Five minute Travel Time increase for having only Three Pesos Travel Cost reduction.

The results of the Scenarios proved that Travel Time and Travel Cost are very important to students especially during their travelling to school.

Table 1 Services and Amenities considered when switching to Pasig River ferry

	Weighted Mean	Weight/ Factor	Rank
1. Must have a shorter travel time compared to my current mode of transportation	2.46	1	Rank1
2. The fare cost should not be too much expensive for student	3.15	1.29	Rank2
3. Must have a minimal waiting time for ferry boat arrival	4.04	1.65	Rank4
4. Convenient (easy accessibility and all-day availability)	3.9	1.59	Rank3
5. Not difficult to transfer from my previous mode to Pasig River Ferry	5.62	2.29	Rank7
6. Comfortable and Enjoyable Journey (adequate seats, air-conditioned boats	4.31	1.76	Rank5
audio-video entertainment and separate comfort rooms for male and female			
7. Safety of Travel (Trained safety officer and life vest should be on-board)	4.4	1.79	Rank6

Table 2 Reason for not taking Pasig River Ferry Service

	Weighted Mean	Weight/ Factor	Rank
1. No PRFS Station is near to my home	2.32	1	Rank1
2. Fare is too much expensive	3.16	1.37	Rank2
3. Waiting time is too long	3.48	1.5	Rank4
4. It is difficult to transfer to Pasig River Ferry	4	1.73	Rank5
5. Unsafe (Danger of collision with barges and other vessel)	4.66	2.01	Rank6
6. Still satisfied with my current mode of transport	3.31	1.43	Rank3

3.7 Switching Simulation Results
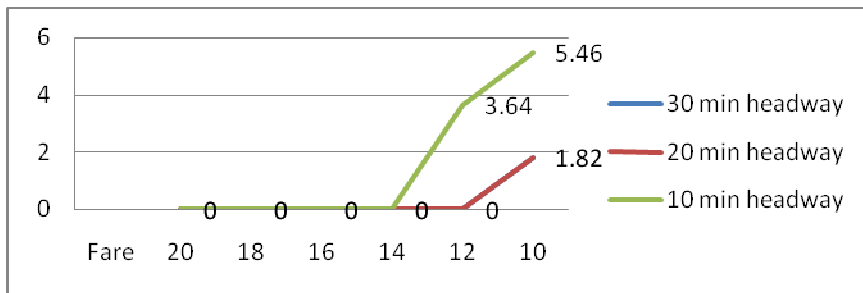
The results of the estimation are shown below:

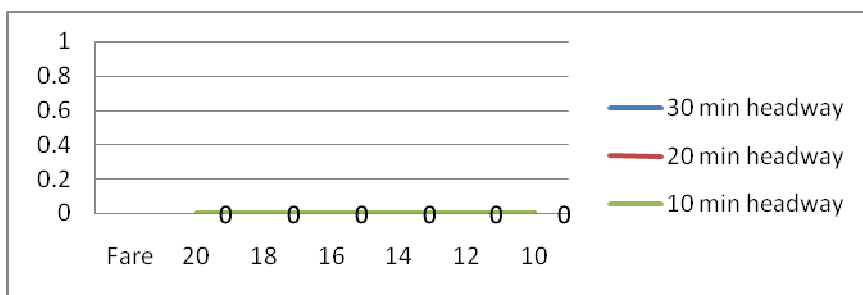Figure 2 Switching Percentage of respondents from Manila City for Case A Scenario

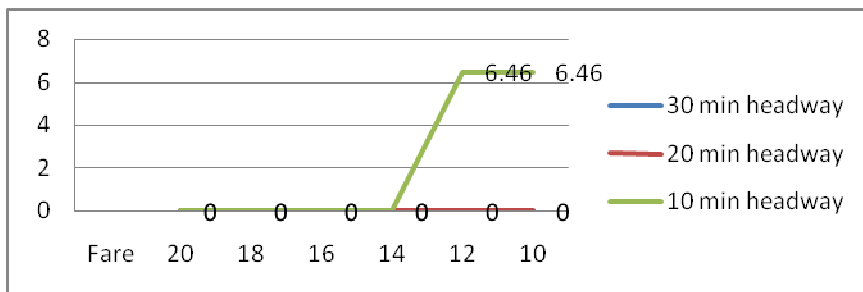Figure 3 Switching Percentage of Manila City respondents for Case B Scenario

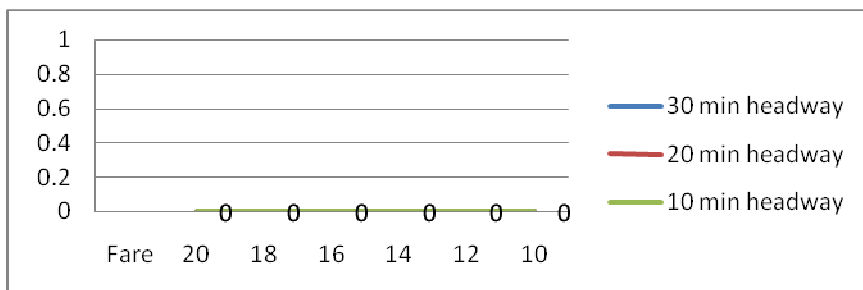Figure 4 Switching Percentage of Mandaluyong respondents for Case A Scenario

Figure 5 Switching Percentage of Mandaluyong City respondents for Case B Scenario
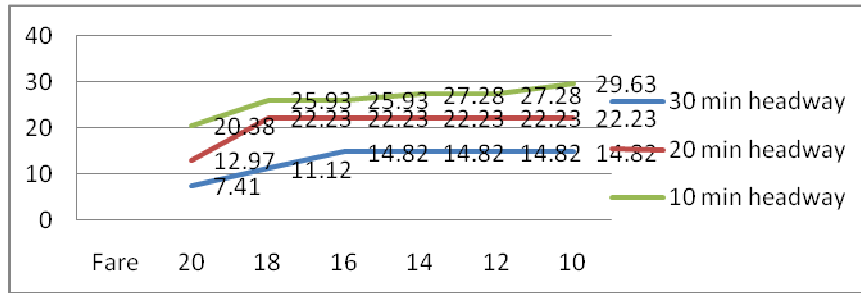
Figure 6 Switching Percentage of Pasig City respondents for Case A Scenario
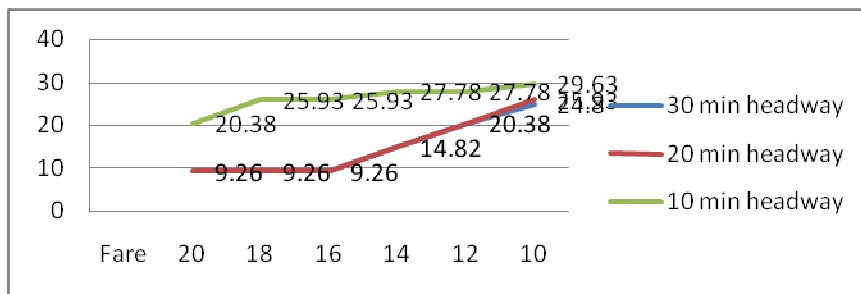

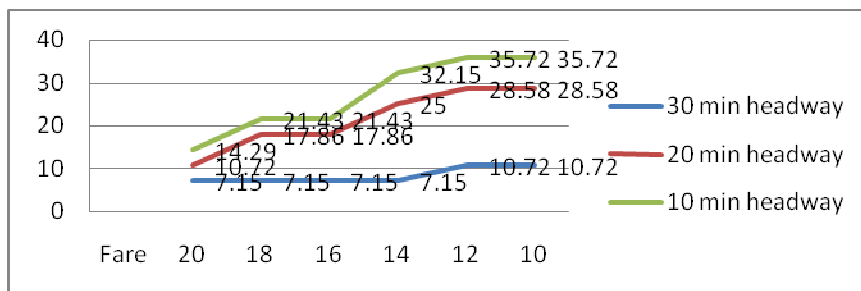Figure 7 Switching Percentage of Pasig City respondents for Case B Scenario

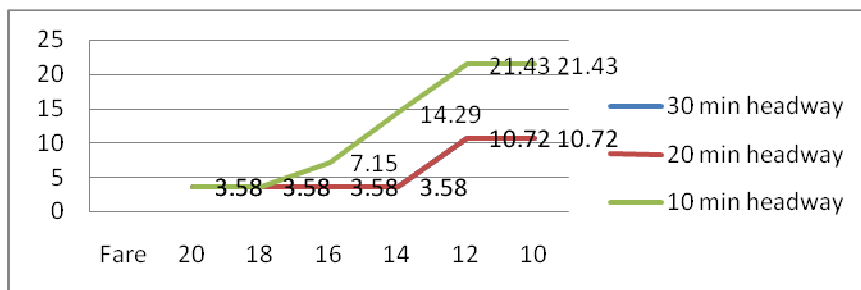Figure 8 Switching Percentage of Pasig City respondents for Case A Scenario

Figure 9 Switching Percentage of Pasig City respondents for Case B Scenario

The simulation of different switching scenarios was done. One important observation from the models is the behavior of the switching percentages at the Three Design Headway Interval. It can be observed that the present headway of Thirty Minutes (30 minutes) always get a lowest percentage when the three design headways are compared. The Ten Minute (10 minutes) Design Headway always gets better switching results. When the three design headways are compared and when also observing the fare cost, still the present thirty minute design headway gets the lowest percentage. The present headway cannot achieve at least the ten percent mark. The highest switching percentage is attained at the ten minute design headway at the Ten Pesos (P10.00).

It can also be observe that there is a better results of switching at Case A Scenario wherein time is reduce in return the travel cost is increase.

4. CONCLUSION

4.1 Factors of Switching

The factors which have the most significant influence to the switching behavior of PUP students to Pasig River Ferry Service are **Awareness** and **Interest.**

Awareness gives a person an overview or introduction to the ferry service. There is a higher probability of switching if a person know that a certain Pasig River Ferry Service exist along with the other modes of transportation. Also a person's awareness to the location of a PRFS station plays a significant role in his switching behavior.

Interest to switch is greatly influence by Accessibility, frequency and consistency of service, In-vehicle Travel Time, Affordability, Comfort ability and Satisfaction with the current mode.

A. Accessibility – the more accessible the station is, the better it will be patronize. If a station is far away from home and one need to take a ride first before arriving at the station, a student might have a second thought of switching to Pasig River Ferry Service. A traveler will find the easiest and the shortest way of travel he can get because time is very important to students. Students who only need to walk had a better chance of switching. The distance of a Ferry Station to one's origin plays a significant influence over the individual's switching decision.

B. Affordability – students will find the cheapest way of travelling since their travel cost allowance is only limited. Based from the results of daily allowance distribution, most of PUP students belong to middle-low income class of family. If a PUP student find a ferry ride to be expensive and will consume large portion of his allowance, he might get a second thought of switching. Also there is a significant share of students who disagree to the present flat rate fare of 20 Pesos and this shows that the present flat rate fare is less effective to PUP students thus the ferry service should provide a fare system that will compete equally with the fare of pubic transport modes. As from the results of the simulation, the switching probability of a student goes higher as the fare of Pasig River Ferry Service goes lower.

C. Frequency and consistency of service - the lesser the waiting time, the better for the PRFS

will be patronize. Long waiting time causes delay which affects the travel of each ferry ride. As from the respond of students to 15 to 30 minutes waiting time, most of them disagree. This strongly shows that the present headway of PRFS is ineffective and less accommodating to PUP students. As from the results of the simulation, the switching probability of a student goes higher as the headway interval or waiting time become shorter.

D. In-Vehicle Travel Time - the lesser the students experience any delays, the more they will patronize the service. In the case of PRFS, delays do not happen on the link but on the station cause by the long waiting time. If a student find that travelling through PRFS is longer, he may still do his usual travel

E. Comfort – this factor has something to do with the services. Students sometimes afford to pay more just to have a comfortable and fresh start when going to school

F. Satisfaction with the current mode - this factor plays a significant influence to the decision of switching to PRFS. If a student finds that he is still satisfied with his current condition of travel by using his current mode, there is no sense to switch to other modes since their current mode still provides them with satisfying services.

4.2 Percentage of switching

A computer program for the simulation of the switching percentage of PUP students to Pasig River Ferry Service given various travel time and travel cost was developed. The present software is limited by the assumptions made upon its development.

The following results were established based on the simulation run undertaken in this study.

1. There is a significant increase in the switching percentage as the headway decreases

2. There is a significant increase in the switching percentage as the travel fare decreases.

3. The present headway of 30 minutes is very ineffective to students from Manila City, Mandaluyong City, Pasig City and Makati city

4. The Present flat rate fare of 20 Pesos (discounted for student fare) is still ineffective to students from Manila City, Mandaluyong City, Pasig City and Makati City

5. The highest percentage of switching based on time alone is at the ten (10) minute headway

6. The highest percentage of switching based on fare cost alone is at 10 Pesos

5. RECOMMENDATIONS

These are the recommendations that the researchers came up based from the results of the study:

1. Pasig River Ferry Service can be better promoted through information placed on Billboards or tarpaulins

2. Put better signage and directional instructions that will direct the public on how to access the station (i.e., station location, nearest public transport terminal to the station)

3. Pasig River Ferry Service Operators should provide a fare system that will closely compete with public mode of transportation and less expensive for students.
   - For Station in Manila and Mandaluyong, the flat rate should be reduced to only10 Pesos
   - For Station in Pasig and Makati, the flat rate should be reduced to 15 Pesos

4. Reduce the delay by redesigning the headway to provide a faster travel for students
   - 10 Minute headway is necessary for the Pasig River Ferry Service Pasig Line to increase the demand

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