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TRAVEL BEHAVIOR AND RESPONSES TO CHANGE IN TRANSIT FARE:
A COMPARATIVE STUDY OF URBAN RAIL PASSENGERS
BETWEEN BANGKOK AND MANILA

Mr. Marcus Kyle Taracatac Baron

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กรุงเทพมหานคร ประเทศไทย และเมโทรมะนิลา ประเทศฟิลิปปินส์ ต่างมีระบบรางในเมืองเท่ากัน 3 ระบบ เป้าหมายของระบบขนส่งมวลชนทางราง คือ บรรเทาการจราจรติดขัด และให้ประชาชนสามารถเข้าถึงสถานที่ต่างๆ ได้ง่ายขึ้น อย่างไรก็ตาม แม้ระบบขนส่งมวลชนทางรางในเมืองจะมีความแตกต่างกัน แต่ทั้งสองประเทศมีความหนาแน่นของประชากรและสภาพจราจรคล้ายคลึงกัน เมื่อเปรียบเทียบระบบขนส่งมวลชนทางรางทั้ง 3 ระบบ ในกรุงเทพมหานครและเมโทรมะนิลา พบว่า ค่าโดยสารในกรุงเทพมหานครมีราคาสูงและมีช่วงกว้าง ในขณะที่ค่าโดยสารในกรุงมะนิลาต่ำมาก การศึกษานี้มุ่งเน้นที่การประเมินและเปรียบเทียบลักษณะโครงสร้างพื้นฐานในระบบขนส่งมวลชนทางรางในเมืองและผู้โดยสารของทั้งสองประเทศ โดยใช้แนวคิดความยืดหยุ่นของราคาที่แสดงความอ่อนไหวของจำนวนผู้โดยสารต่อการเปลี่ยนแปลงค่าโดยสารระบบขนส่งมวลชนทางราง จากการศึกษา พบว่า ค่าความยืดหยุ่นของค่าโดยสารมีค่าเท่ากับ -2.537 และ -2.051 สำหรับระบบรางในเขตกรุงเทพมหานครและมะนิลาตามลำดับ เห็นได้ว่าค่าการตอบสนองของผู้ใช้บริการในระบบขนส่งมวลชนทางรางในกรุงเทพมหานครมีความอ่อนไหวมากกว่าเมื่อเทียบกับผู้ใช้บริการในมะนิลา การวัดความอ่อนไหวต่อปัจจัยราคา (Price Sensitivity Measurement) ที่ปรับปรุงแล้ว หรืออีกชื่อหนึ่งคือ Kishi’s Logit PSM (KLP) ซึ่งใช้กำหนดช่วงราคาค่าโดยสารที่เหมาะสมสำหรับระบบขนส่งมวลชนทางรางในเมือง ผลการศึกษาพบว่าอัตราค่าโดยสารเมโทรมะนิลาควรปรับราคาสูงขึ้น ขณะที่กรุงเทพมหานครมีค่าโดยสารเหมาะสมอยู่แล้ว

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MARCUS KYLE TARACATAC BARON: TRAVEL BEHAVIOR AND RESPONSES TO CHANGE IN TRANSIT FARE: A COMPARATIVE STUDY OF URBAN RAIL PASSENGERS BETWEEN BANGKOK AND MANILA. ADVISOR: ASSOC. PROF. KASEM CHOOCHARUKUL, Ph.D., CO-ADVISOR: ASSOC. PROF. KUNIHIRO KISHI, D.Eng., 100 pp.

Bangkok City, Thailand and Metro Manila, Philippines each have three urban rail systems. Such rail systems aim to help alleviate the traffic congestion and provide more accessibility and convenience of mass transportation to commuters. The urban rail systems in both areas are different from each other but the city setting is quite similar in terms of traffic congestion and population density. Comparing all three urban rail systems in Bangkok and Manila, the transit fare for Bangkok rails are quite high and wide-ranging compared to the very low transit fare offered in the Manila rail counterparts. This study focuses on evaluating and comparing the characteristics of the urban rail system infrastructure and passengers in both cities. Using the concept of price elasticity we demonstrated the sensitivity of urban rail passengers when a change in transit fare is implemented. Fare elasticity values obtained were found to be -2.537 and -2.051 for the Bangkok and Manila rails, respectively, implying that the responsiveness of Bangkok rail users were higher compared to the Manila rail users when a price change is implemented. A modified Price Sensitivity Measurement (PSM), Kishi's Logit PSM (KLP), was also used to determine reasonable price range for transit fare in both urban rail systems. Results indicated that Manila rail transit fares could be increased, while Bangkok rail systems already had a reasonable fare setting.

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Chapter 1
Introduction

1.1 Background of the Study

The Bangkok Metropolitan Region (BMR) in Thailand and the National Capital Region (also known as Metro Manila/NCR) in the Philippines are similar to each other when it comes to the population density and traffic situations. According to the Bureau of Registration Administration in Thailand (2013), out of the 64.4 million population of Thailand in 2012, a population of 10,455,800 belongs to the BMR, which is 16.2% of Thailand's total population. On the other hand, according to the census of the National Statistics Office in the Philippines (2012), out of the 92.34 million people in the whole country, 11,855,975 people are located in Metro Manila which is 12.8% of the country's total population.

Thailand and the Philippines have urban rail transit systems in their capital regions. Both urban rail transit systems are considered to be a great alternative for commuters due to the worsening traffic conditions in both cities. Both Bangkok and Metro Manila currently have three operating urban rail transit systems, namely, Bangkok Mass Transit System (BTS), Metropolitan Rapid transit (MRT), and the Suvarnabhumi Airport Rail Link (ARL) all found in Bangkok City, and the Light Rail Transit 1 (LRT1), Light Rail Transit 2 (LRT2), and the Metro Rail Transit (MRT3) in Metro Manila. The urban rail systems in both Metro Manila and Bangkok are shown in Figure 1.1 and Figure 1.2.

The people of Bangkok started using the urban rail transit system on December of 1999 when the BTS Sky train was opened. Built and operated by the Bangkok Mass Transit System Public Limited (BTSC), the elevated train system is located at the heart of Bangkok City serving shopping, business, and tourist centers. The BTS Sky train has two lines, namely, the Sukhumvit Line and the Silom Line, with a total of 36.9km of service line and it is composed of 36 stations. A single journey ticket costs 15.00 Baht to 52.00 Baht depending on the distance (BTSC, 2011). Bangkok City also has an underground train system called the MRT which was fully operational on July of 2004. The 20km route has

18 subway stations. Bangkok Metro Company Limited (BMCL) is the concessionaire of the MRT, and the price fare ranges from 15.00 Baht to 40.00 Baht depending on the distance (Thailand, 2013a). In 2011, the Suvarnabhumi Airport Rail Link (SARL) became fully operational. Owned and operated by the State Railway of Thailand (SRT), the 28.6km line composed of 8 stations is intended to serve passengers to and from the Suvarnabhumi airport to downtown Bangkok. The price fare ranges from 15.00 Baht to 45 Baht, with an express line from the city to the airport which costs 90.00 Baht (SRT, 2013).

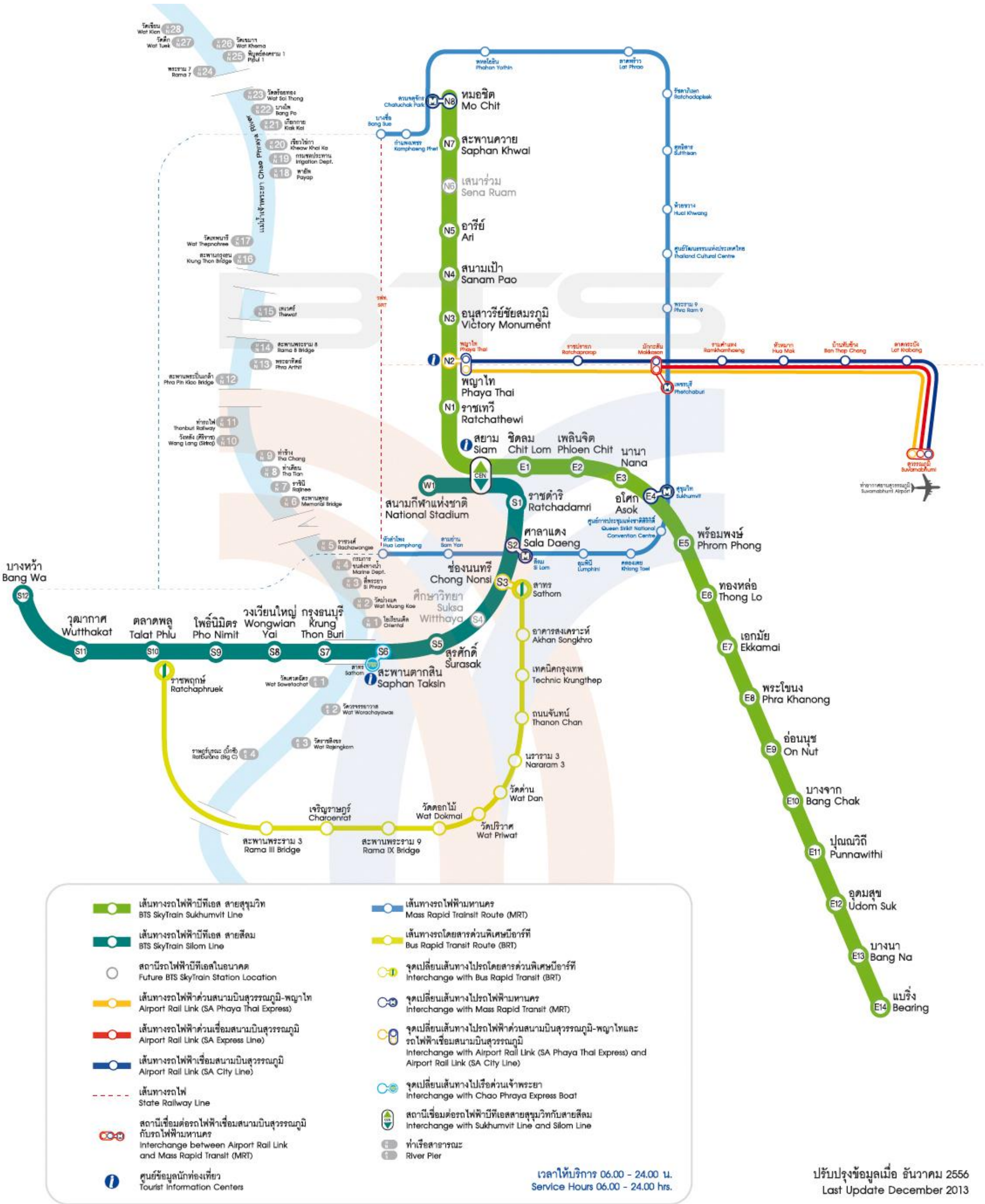


Figure 1.1 Bangkok City Urban Rail Transit Systems(BTSC, 2013)

The urban transit system in Metro Manila started in 1985 when the LRT1 was opened to the public. It was operated and maintained by METRO, Inc. for 16 years but is now currently operated and maintained by the Light Rail Transit Authority (LRTA). The LRT1 has a 20km line composed of 20 stations (LRTA, 2013a). In 1999, the second urban rail system in Metro Manila became fully operational, which is called the MRT3. The motivation of building the MRT3 is from one of the world's highest volume thoroughfares, Epifanio Delos Santos Avenue (EDSA) highway. The MRT3 aimed to alleviate the congestion in the 24km highway, which cuts through social, economic, and political centers. The MRT3 has a 16.9 km line with 13 stations which was built and maintained by the Metro Rail Transit Corporation (MRTC), while the Department of Transportation and Communications (DOTC) is in charge with the regulation of fares and operations(Manila, 2012b). The third and latest urban rail transit in Metro Manila is the LRT2 which became fully operational in 2004. It is composed of 11 stations in a 13.8km stretch and it is also operated and maintained by the LRTA. The LRT2 is a heavy rail transit but was named LRT2 due to the same management of the LRT1, which is also the LRTA (LRTA, 2013a). Both LRT1 and LRT2 systems currently have a price fare range of 12.00 Pesos to 20.00 Pesos (9.00 Baht to 15.00Baht) depending on the number of stations travelled, while the MRT3 has a price fare of 10.00 Pesos to 15.00 Pesos (7.00 Baht to 11.00 Baht) again depending on the number of stations travelled.

In the case of Bangkok urban rail, the patronage of the MRT is relatively low, while the BTS Sky train and the Suvarnabhumi Airport Rail Link have recently reached the capacity of the system. As for Metro Manila, the LRT1 and the MRT have been experiencing over capacity for years now and it is continuously growing, while the LRT2 is rapidly increasing in patronage as well. Table 1.1 shows the most recent number of ridership of urban rail systems in both Bangkok and Manila.

This study would want to see the preference of people regarding the transit fare, keeping in their minds that the reasonable transit fare they prefer would affect the quality of service. Using Kishi's Logit PSM, a range of commuter's preference on transit fare can be estimated. With this, the study aims to investigate the effects when a change in transit fare is implemented. The concept of price elasticity will be used to see these effects, since price elasticity is used to determine the sensitivity of urban rail users when the transit fare is changed. The value of the elasticity could be due to a variety of factors; hence, these factors affecting the change in transit fare will be investigated as well.

Figure 1.2 Metro Manila Urban Rail Transit Systems (LRTA, 2013a)

Table 1.1 Average Daily Ridership of Urban Rail System in Bangkok and Manila

Metro Manila		Bangkok	
Urban Rail System	Average daily Ridership (passengers)	Urban Rail System	Average daily Ridership (passengers)
LRT1	480,000	BTS	575,000
LRT2	200,000	MRT	237,000
MRT	560,000	SARL	58,500

Source: LRTA; MRTA; BMCL; BTSC; SRT

1.2 Problem Setting

Several difficulties are being experienced by the urban rail authorities in both Bangkok and Metro Manila. With the subsidized transit fare, the LRT and the MRT lines in Metro Manila experiences over capacity of about 210,000 passengers, which leads to the demand for more coaches (ABSCBNnews, 2014). Currently, a new system is being used where the authorities only allow 500 passengers per station to enter the platform to accommodate passengers on other stations due to the excessive number of passengers using the system (Diola, 2013). As for the case of Bangkok, the urban rail system aims to serve more passengers in the future years to come to help alleviate the congestion problems in the city. The MRT hopes to increase ridership to about 400,000 passengers but current ridership is only at 200,000 (Thailand, 2013b). Also, the lower class people are unable to use the rail system due to the high urban rail transit fare in Thailand (Bengtsson, 2006).

The transit fare is not yet clear in Bangkok and in Manila. Fare integration is important in the urban rail since it will reflect the costs and the quality of service of the urban rail (Bray & Sayeg, 2013). Obtaining the preference of urban rail users about the transit fare would seek clarity of what price ranges of the transit fare would be reasonable. With the change in transit fare, the sensitivity of people in patronizing the urban rail is to be known.

1.3 Research Objectives

The main objective of the study is to investigate the travel behavior of urban rail passengers and their responses to change in transit fare on both urban rail transit systems in Bangkok and Metro Manila.

The specific objectives of the study are:

- To determine and compare the fare elasticity of a change in transit fare in both cities.
- To obtain the range of the reasonable prices of transit fare from the user's preferences in both Bangkok City and Metro Manila.
- To characterize and compare urban rail transit passengers in both cities.

1.4 Scope of the Study

The study will only consider the current urban rail transit users in both Bangkok City and Metro Manila which are limited to:

- Urban rail users who use the single journey tickets only.
- The most common ticket price will only be considered in evaluating using Kishi's Logit PSM.
- A face to face survey will be conducted to gather data using a survey questionnaire.

1.5 Expected Benefits

This study aims to assess the travel behavior of commuters and the other factors that will be affected with respect to a change in transit fare. Upon the completion of the study, it is expected that it will be beneficial to the following:

- For the urban rail transit authorities to have a view on the possible effects of a change in transit fare.

- The result of the study could be a basis in determining the transit fare for urban rail in other countries with the same city setting of Bangkok and Manila
- To benefit in the upcoming ASEAN Economic Community (AEC) integration 2015, since urban rail is an expanding trend in the region.

1.6 Research Framework

Figure 1.3 shows the steps in pursuing and completing the thesis. A review of the current situation was done which consists of the existing problems, current transit fares, and future outputs of the urban rail systems in Bangkok City and in Metro Manila. This is to further understand what can be the possible effects of the current transit fare. With this, a pilot survey will be conducted to test the validity, clarity, understandability, and the quality of questions prepared. From this pilot survey, a main survey will be developed and conducted to gather data needed for the analysis of the study. To analyze data gathered, descriptive statistics and other statistical tests will be done to determine the price elasticity and travel behavior of urban rail users in both cities. Lastly, the comparison and evaluation of results will be done.

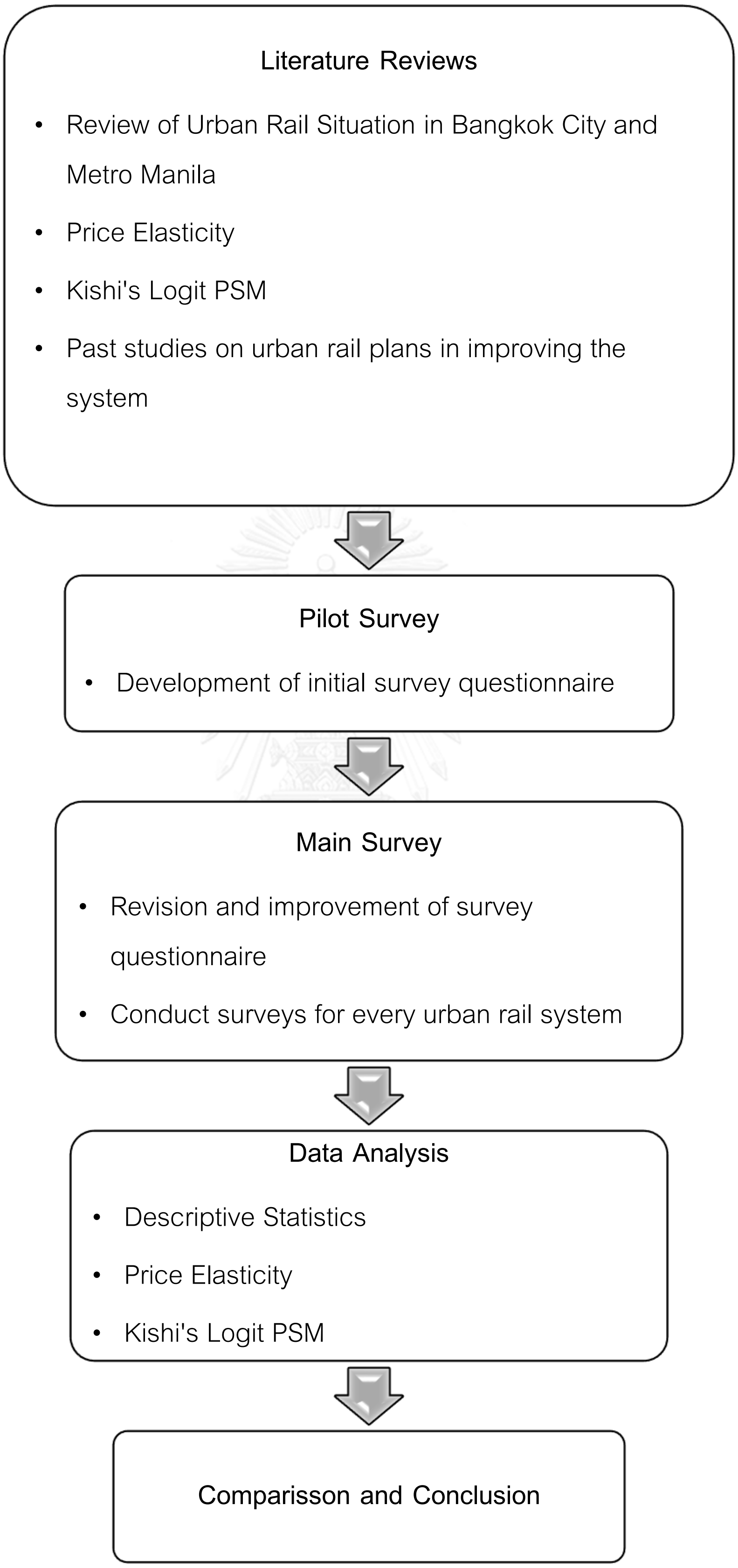


Figure 1.3 Research Framework

Chapter 2
Literature Review

2.1 General

This chapter discusses related literature reviews that support this thesis. The first part reviews all urban rail systems in both Bangkok and Manila in terms of the past, present and future projects and situations. The next part discusses price elasticity, its definition and uses, and past transportation studies using price elasticity. The next part talks about the Kishi's Logit PSM (KLP) method. A breakdown on where the KLP is based and how it was created, the application of KLP, and past studies using KLP is discussed. Lastly, research gaps are discussed to which this paper is based from.

2.2 Current Urban Rail Transit Situations

2.2.1 Bangkok Metropolitan Region Urban Rail Transit System

The Bangkok Metropolitan Region (BMR), which includes Bangkok city and five neighboring provinces, is intended to have a connection using an integrated metro system. Currently, there are three urban rail system projects totaling 75 kilometers in length and the system continues to expand led by private sector participation. These three urban rail systems are the BTS Sky train, the MRT, and the Suvarnabhumi Airport Rail Link (ARL)

2.2.1.1 BTS Sky train

The BTS Sky train was opened on December 5, 1999 and it marked the day when Thailand operated its first electric mass transit system. The elevated urban rail system was built and operated by the Bangkok Mass Transit System Public Company Limited (BTSC) and it was fully funded by private enterprise. The BTS Sky train is composed of two lines, namely, the Sukhumvit line and the Silom Line with the central station at Siam station where the two lines are connected. A combined 36.9 kilometers of rail line connecting 34 stations make up the entire BTS sky train, to date. The BTS sky train is powered by third rail system that supplies electricity to the system. It has a capacity of 1000 passengers per journey per train that serves the public daily from 6:00am to 24:00mn. Commuters can connect to the other two urban rail transit in Bangkok City, the MRT and the Suvranabhumi Airport Rail link. Asok station, Mo Chit station, and Sala Daeng stations are the connections from BTS sky train to the MRT, while commuters can connect to the Suvarnabhumi Airport Rail link from Phaya Thai station.

The Sukhumvit line was initially a 17 kilometer line that serves north and south east parts of Bangkok city which where most business and tourist centers are located. On August 12, 2011, an extension of 5.25 kilometers was added to the Sukhumvit line from On Nut to Bearing Station.

Silom Line was 6.5 kilometers when built which serves the west and south west parts of Bangkok City. An extension of 2.2 kilometers on the Silom line was opened on August 23, 2009 with stations Saphan Taksin to Wong Wian Yai located on Thonburi side of the Chao Phraya River. Another extension was done on February 14, 2013 which is 2.17 kilometers long opening Pho Nimit station and Talat Phlu station. It continued to extend on December 5, 2013 opening Wutthakat station and Bang Wa station.

There are two kinds of tickets for the rail users to purchase, the magnetic tickets and the SmartPass tickets. First, the magnetic ticket, which is composed of the single journey tickets and the one day pass tickets. The cost of the single journey ticket ranges from 15.00 Baht to 52.00 Baht which was just updated on January 1, 2014. The single journey transit fare depends on the number of stations travelled for the first seven (7) stations, and counting ten (10) stations from the 8th station the ticket will then cost 42.00 Baht while the remaining stations will cost 52.00 Baht. The one day pass ticket is another type of magnetic ticket where commuters are allowed to have unlimited rides on the BTS sky train, and this costs 130.00 Baht. The other kind of ticket is the BTS SmartPass which is composed of the stored value card and the 30 day SmartPass (period pass). The SmartPass ticket contains an electronic chip which is intended for data storage. An amount of money is stored into the SmartPass which makes it more convenient for the commuters since it eliminates the hassle of lining up for a single journey ticket. Any amount can be put into the SmartPass ticket with a minimum of 100.00 Baht. Discounted fares are also given to SmartPass users, the elderly and the students.

One of the problems the BTS is experiencing as of the moment is the single track and single platform at the Saphan Thaksin Station. This makes it difficult for train operators due to the queue and also the passengers due to the high volume of people going in and out of the train, and this result to a delay in train operation. Figure 2.1 shows Saphan Thaksin station's single track and a single platform.

Figure 2.1 Saphan Thaksin Station (Photo by: Reallogic, 2015)

Another challenge for the BTS sky train is that the number of ridership is increasing rapidly where the 2013 data shows a daily ridership of 574,096. This exceeds the projected capacity of the BTSC.

One more issue of the BTS is that the low income groups of people are not able to afford the BTS sky train system due to the high transit fare. A study by Bengtsson (2006) states that the average income of the low income people is not sufficient enough to ride the BTS daily due to the high transit fare. He stated that it will be a big portion of the income of poor people if they ride the BTS. He also stated that at the start of the operation of the BTS, the expected ridership was not met right away also due to the high transit fare but nowadays commuters have adjusted since they try to save time by using the BTS system and not going through the traffic congestion of Bangkok (Bengtsson, 2006). The trend of the increase of ridership as well as the corresponding change in transit fare averages through the years are shown in Figure 2.2, which supports the statement that commuters have adjusted. Regardless of the increase in price of the transit fare of the BTS, commuters would still choose to ride the BTS.

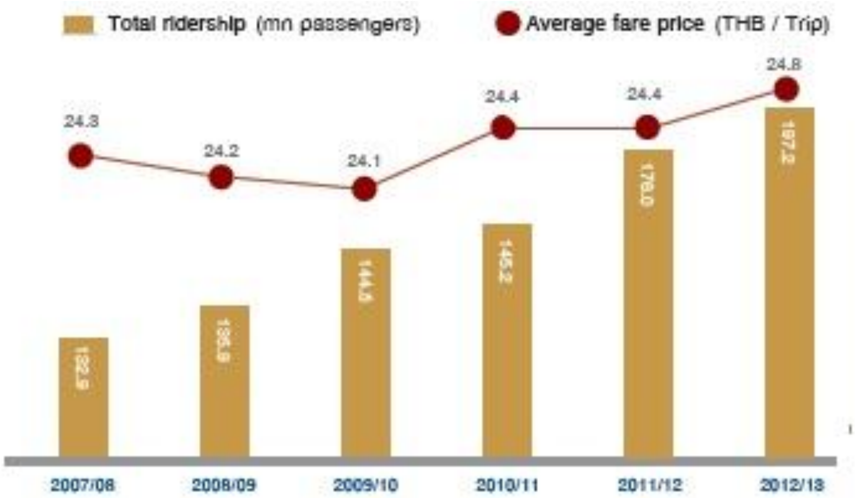


Figure 2.2 Yearly Increase in Transit Fare with Corresponding Yearly Ridership (BTSC, 2013)

As for the future plans of the BTS, at the northern part of the line a current extension is being done which will eventually open the station Sena Ruam. Also, at the southern part of the line Suksa Witthaya station is currently being built. The BTS sky train continues to expand to serve a broader community of potential passengers in suburban Bangkok.

2.2.1.2 Mass Rapid Transit (MRT)

The MRT which is also known as the Chaloem Ratchamongkhon Line was opened to the public on July 3, 2004. The MRT is an underground heavy mass rapid transit that is operated and invested on by the Bangkok Metro Public Company Limited since August 1, 2000 and will continue to be for 25 years. It is composed of 18 stations starting from Hua Lamphong to Bang Sue as seen in Figure 1.2. It is about 20 kilometers from end to end and it continues to expand due to the ongoing extension projects. The MRT operates 19 rolling stocks with 3 cars connected which is powered by power rails or third rails and it can accommodate 900 passengers per trip. It operates daily from 6.00 to 24.00.

As of the latest ridership data of 2013, there is an average daily ridership in the MRT of 236,000. The MRTA would want to increase ridership to 350,900 passengers per line per day by 2016 (BTSC, 2013). Currently, the average ridership of the MRT is increasing every year by about 15% according to BMCL. Figure 2.3 shows the history of ridership of the MRT compared with the BTS ridership.

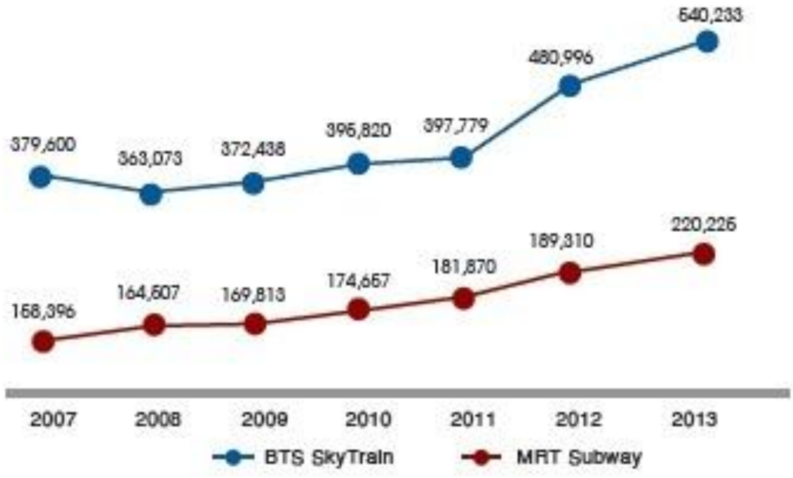


Figure 2.3 Comparison of Ridership between the MRT and the BTS (BTSC, 2013)

Tickets for the MRT are of 3 types; the single journey token, stored value ticket and the period pass ticket. The single journey token costs at a range from 16.00 Baht to 40.00 Baht depending on the distance travelled for the first 11 stations, where 12 stations or more will cost the maximum of 40.00 Baht. Children and elderly are benefited with the discounts they get, which ranges from the minimum of 8.00 Baht to a maximum of 20.00 Baht. The stored value card is the refillable card where MRT users are able to enter the platform without queuing up for single journey tokens. They initially cost 230.00 Baht and can be reloaded at a minimum of 100.00 Baht. Lastly, the period pass ticket is for unlimited rides for a given number of days (1 day, 3 days, 15 days, 30 days) and they range from 120.00 Baht to 1,400.00 Baht.

Several extension plans are planned for the MRT to accommodate higher ridership in the future. The purple line would extend Bang Sue station to Bang Yai Station. A commuter line project, which is the red line, would benefit the MRT which would serve from Bang Sue station to Taling Chan section. The Blue line extension would further extend Bang Sue station to Thra Phra section. Lastly, an extension in Hua Lamphong station to the Bang Khae section will hopefully increase ridership.

2.2.1.3 Airport Rail Link (ARL)

The Suvarnabhumi Airport Rail Link (ARL) started construction on the year 2006. It started serving the public on August 23, 2010 and became fully operational on January 4, 2011. Owned and operated by the State of Railway of Thailand (SRT), the main purpose of the SARL was to connect downtown Bangkok to the Suvarnabhumi International Airport. The SARL system starts in Phaya Thai station, which can connect to the Phaya Thai BTS station, and ends at the Suvarnabhumi International Airport with a total distance of 28.6 kilometers composing of only 8 stations. There can be two choices for commuters using the SARL; they can ride the SA City Line or the SA Express Line and both offer services from 6.00am to midnight. The SARL is an elevated track system where Suvarnabhumi Airport station is the only underground station in the system.

The SA City Line offers services from Phaya Thai station to Suvarnabhumi Airport by stopping at all other 7 stations. From end to end, the service will be about 30 minutes of travel time. Commuters can connect to the existing BTS station and MRT station from the SARL, Phaya Thai station and Makkasan Station, respectively. Depending on the distance travelled by the SA City Line, commuters pay a transit fare at the range of 15.00 Baht to 45.00 Baht. Currently, the SA City Line runs five (5) trains with three (3) cars per train.

A faster choice for the SARL users is called the SA Express Line where they can travel from Phaya Thai station to Suvarnabhumi Airport in just 17 minutes with a speed of 160 kph. The SA Express Line does not stop at any of the stations between Phaya Thai and Suvarnabhumi station. The express line has 4 trains available with four (4) cars per train wherein it is composed of three (3) passenger cars and one (1) baggage car. There are 170 seats in the passenger cars intended for the comfort of the passengers. The cost of riding the SA Express Line is 90 baht for one way of service.

The system was not intended for to become a mass transit since it only has a capacity of 745 passengers per train or 14,000 to 50,000 average daily passengers. Currently, the average daily ridership, according to Siam Intelligence (2013), is 58,500 passengers daily where 1,936 uses the Express Line and 56,562 passengers uses the City Line.

As for the ticketing system, similar to the MRT system, the SARL offers a single journey token and a stored value card for convenience of commuters.

There are several plans for the development of the SARL. Ever since the beginning, Makkasan station was intended for convenience of passengers going to the Suvarnabhumi station because the station has an existing park and ride facility and check in counters for the baggage of Suvarnabhumi airport customers. It is said that it will only take 15 minutes from Makkasan to the airport using the express line. Also, the SRT is planning to buy 7 more trains for the SARL to meet the demand. Lastly, there is a future plan to connect the international airport (Suvarnabhumi airport) to the domestic airport (Don Meuang airport) since many tourists and locals often connect to different domestic flights in Bangkok from an international flight.

2.2.1.4 Future of the Urban Rail Link in Thailand

A master plan for the urban rail transit in Bangkok Metropolitan Region was planned on 2011. It aims to connect the outskirts of the capital city as well as to complete a connecting and continuous line for the city of Bangkok. Ten lines are in line with the planning of the master plan where construction is to begin within the years 2011-2015. A total distance of 410 kilometers of train lines is expected to operate by 2019, and an additional 54 kilometers after that year. The total 464 km mass rapid transit master plan as well as the authorities and companies in charge is shown in Figure 2.4.

Projects	Distance (Km.)	Routes	Responsible Agencies
1. Red Line (Thammasat University, Rangsit Campus-Mahachai)	80.8	connecting the outskirt areas to Bangkok in the North-South line	SRT
2. Light Red Line (Salaya-Hua Mak)	54	connecting the outskirt areas to Bangkok in the West-East line	SRT
3. Airport Rail Link (Don Mueang Airport-Suvarnabhumi Airport)	50.3	connecting between the two airports	SRT
4. Green Line (Lam Luk Ka-Bang Pu)	66.5	connecting the North-East, around Phahon Yothin Road and Sukhumvit Road	MRTA
5. Light Green Line (Yotse-Bang Wa)	15.5	under the responsibility of BMA	BMA
6. Blue Line (Bang Sue-Hua Lamphong-Tha Phra-Phutthamonthon Sai 4)	55	connecting the Chaloem Ratchamongkhon Line to form a ring network to the inner areas of Bangkok	MRTA
7. Purple Line (Bang Yai - Rat Burana)	42.8	main route connecting the North-South	MRTA
8. Orange Line (Charan Sanit Wong-Min Buri)	32.5	main route connecting the East-West of Bangkok	MRTA
9. Pink Line (Khae Rai-Min Buri)	36	connecting the North-East and Government Center on Chaeng Wattana Road	MRTA
10. Yellow Line (Lat Phrao-Sam Rong)	30.4	connecting Lat Phrao Road and the East of Bangkok	MRTA
Total	464		

Figure 2.4 Mass Rapid Transit Master Plan in BMR (BTSC, 2013)

2.2.2 Metro Manila Urban Rail Transit System

Similar to the Bangkok Rail System, Metro Manila also has 3 urban rail system lines which connect several cities in the national capital region (NCR). The urban rail system in the region currently has 48 kilometers of line which continues to expand to serve more users in the outer areas of the region. The urban rail systems are the LRT1, the MRT3, and the LRT2.

2.2.2.1 Light Rail Transit Line 1 (LRT1)

The LRT1 began its 14-month feasibility study in 1976 which was funded by the World Bank. The initial plan of the LRT1 was to become a street level railway. After further review by the Ministry of Transportation and Communications or MOTC (Now called the Department of Transportation and Communications, DOTC), It was changed to an elevated urban rail system because of the many intersections it would affect. This urban rail system is the project of President Ferdinand Marcos during his term which is only one of the many urban rail systems included in his master plan.

LRT1 is an elevated urban rail system which opened on December 1, 1984 and was fully operational on 1985. Operations and maintenance was being headed by METRO, Inc. for 16 years and now replaced by the Light Rail Transit Authority (LRTA), which is a government authority. It currently has a 20 kilometer line which connects the north and south portion of the region passing by the western side of Metro Manila. It has 20 stations which starts at Roosevelt station (North terminal) and ends in Baclaran station (South terminal). Operation of the LRT1 system is from 5:00am to 10:00pm on weekdays, and 5:00am to 9:30pm on weekends and holidays.

Several stations can connect to other urban rail systems in the region as well as the Ninoy Aquino International Airports (NAIA). Roosevelt station, Doroteo Jose station, Taft Avenue station and Baclaran station can connect to the Northern station of the MRT, the LRT2, the southern station of the MRT, and the Ninoy Aquino International Airport, respectively.

There are two kinds of tickets the LRT1 offers, the single journey ticket and the stored value ticket. Depending on the number of stations travelled, the price range of the single journey ticket is from 12.00 Pesos to 20.00 Pesos (approximately 9.00 Baht to 15.00 Baht). The stored value ticket is worth 100.00 Pesos (approximately 70.00 Baht) and it can be used until it has zero or negative credit. Discounts for students and senior citizens are also offered by the LRT1. See Table 2.1 for the more detailed transit fare information.

Table 2.1 LRT1 fare table (LRTA, 2013b)

LRT LINE 1												
Fares excluding those to and from Balintawak or Roosevelt Station					Fares to and from Balintawak or Roosevelt Station							
Distance (no. of inter-stations)	1-4	5-8	9-12	13-17	1-2	3-4	5-7	8-10	11-13	14-16	17-18	19
Single Journey Ticket Fare (Pesos)	12	15	15	15	15	15	15	20	20	20	20	20
Stored Value Ticket Fare (Pesos)	12	13	14	15	13	14	15	16	17	18	19	20

Currently, the LRT1 experiences over-capacity for many years now. According to LRTA, the LRT1 system has reached 480,000 daily passengers considering, it is only a light rail transit system. In 2010, the extension of the LRT1 line has been done but no cars were added to accommodate the demand of passengers. A Crowd Control Scheme has been done due to the overflowing number of passengers in the platform, wherein only 500 people are allowed to enter the platform. Here are the said advantages and benefits of having such scheme according to the LRTA (2013a):

- Increased level of comfort and decreased congestion rate at platform paid area and inside the train.
- Passengers are assured to board the train within 4-5 minutes of arrival at the platform paid area because of the regulated load capacity at the platform.
- Prolonged serviceable life of rail tracks and rolling stock wear and tear conditions are reduced.

- Reduced incidents of door pinning, shoving and pushing of passengers; and,
- Enhanced general security and safety situation at the station.

Note that this scheme is being done in all urban rail systems in Metro Manila (LRT1, LRT2, MRT3). According to Camille Diola (2013), a journalist of a famous newspaper in the Philippines (Philippine Star), passengers are angry at the current scheme since lines outside the platform entering the stations are very ling and uncomfortable due to the heat and long waits in queue. The result of the crowd sourcing scheme implemented by rail authorities in Metro Manila can be seen in Figure 2.5.

Figure 2.5 Commuters Queuing to Enter the Station in the MRT due to the Crowd Sourcing Scheme Implementation (Source: Manila Bulletin)

2.2.2.2 Metro Rail Transit Line 3 (MRT3)

Also known as the Metrostar, the MRT3 was commenced in 1997 and took 3 years to build before it was fully operational in 2000. The line was built on a 24 kilometer highway known as Epifanio Delos Santos Avenue (EDSA), which is considered one of the world's highest volume thoroughfares. The line's main objective was to alleviate the congestion on EDSA as well as build a fast, reliable, and comfortable transit system which cuts to several central business districts in the region. A Build Lease Transfer (BLT) concession was negotiated to a single bidder with several private international sectors, the Metro Rail Transit Corporation was to finance, provide and maintain the line and rolling stock for 25 years. Since then, the government is now planning to take over the BLT concession to avoid the high cost of maintenance in the concession agreement (Manila, 2012a).

The MRT3 is an elevated urban rail system found in the middle of EDSA. It has a total length of 16.9 kilometers which connects the northern and southern parts of Metro Manila. It starts at North Avenue station and ends at Taft Avenue station where users can connect to the LRT1 at both end stations. The central station is Cubao station where users can connect to the LRT2. The MRT3 has a total of 13 stations where access to other transportation services is available.

There are two types of tickets that can be purchased in riding the MRT3, the single journey ticket and the stored value ticket. The single journey ticket cost ranges from 10.00 Pesos to 15.00 Pesos (approximately 7.00 Baht to 11.00 Baht) depending on the number of stations travelled, while the stored value card is worth 100.00 Pesos (70.00 Baht) wherein users can enter the platform depending on the amount in stored the card. The last ride on the stored value card is free regardless of what amount is left. Figure 2.6 shows the summary of transit fare in every station as well as the time table of the trains in the MRT3.

The number of passengers the MRT3 can handle has been over the intended capacity of 350,000 daily passengers. Currently, the daily ridership on the MRT3 is at an average of 560,000 passengers according to the MRTC (Carcamo, 2014). As discussed in section 2.1.2.2., the MRT also implements the Crowd Sourcing Scheme to handle the over capacity situation in the MRT3.

Travel Time Guide / Fare Guide												
Travel Time												
Taft	3:02	5:32	7:18	10:24	12:14	14:24	16:59	20:24	22:54	25:54	27:45	30:00
	Magallanes	2:30	4:16	7:22	9:12	11:22	13:57	17:22	18:52	22:52	24:43	26:58
North Ave		Ayala	1:46	4:52	6:42	8:52	11:27	14:52	17:22	20:22	22:13	24:28
P10.00	Quezon Ave		Buendia	3:06	4:56	7:06	9:41	13:06	15:36	18:36	20:27	22:42
P10.00	P10.00	Kamuning		Guadalupe	1:50	4:00	6:35	10:00	12:30	15:30	17:21	19:36
P11.00	P10.00	P10.00	Cubao		Boni	2:10	4:45	8:10	10:40	13:40	15:31	17:46
P11.00	P11.00	P10.00	P10.00	Santolan		Shaw	2:35	6:00	8:30	11:30	13:21	15:36
P12.00	P11.00	P11.00	P10.00	P10.00	Ortigas		Ortigas	3:25	5:55	8:55	10:46	13:01
P12.00	P12.00	P11.00	P11.00	P10.00	P10.00	Shaw		Santolan	2:30	5:30	7:21	9:36
P12.00	P12.00	P12.00	P11.00	P11.00	P10.00	P10.00	Boni		Cubao	3:00	4:51	7:06
P14.00	P12.00	P12.00	P12.00	P11.00	P11.00	P10.00	P10.00	Guadalupe		Kamuning	1:51	4:06
P14.00	P14.00	P12.00	P12.00	P12.00	P11.00	P11.00	P10.00	P10.00	Buendia		Quezon Ave	2:15
P14.00	P14.00	P14.00	P12.00	P12.00	P12.00	P11.00	P11.00	P10.00	P10.00	Ayala		North Ave
P15.00	P14.00	P14.00	P14.00	P12.00	P12.00	P12.00	P11.00	P11.00	P10.00	P10.00	Magallanes	
P15.00	P15.00	P14.00	P14.00	P14.00	P12.00	P12.00	P12.00	P11.00	P11.00	P10.00	P10.00	Taft
Fare Table												

Figure 2.6 Fare table and Time Table of MRT3 (MRT, 2012)

2.2.2.3 Light Rail Transit Line 2 (LRT2)

The LRT2 is the latest line of the Philippines. It started construction in 1996, but several problems occurred that delayed the construction process. In 2000, construction began again and was completed in 2003. The LRT2 became fully operational in 2004 serving the eastern part of Metro Manila going to the Western part.

It was originally planned to build the LRT2 as a light rail transit but because of experiences from the MRT3 and the LRT1, it was converted into a heavy rail. With this, the building process became very complicated due to the narrow roads it will traverse. Several international companies constructed in different stages and phases of the line, and was mostly funded by Japan Bank for International Cooperation (JBIC).

The LRT2, also known as the Megatren, is being operated and maintained by the Light Rapid Transit Authority (LRTA), which is the same operator of the LRT1. The LRT2 is composed of 11 stations starting from Recto station (West terminal) where users can connect to the LRT1, going to Cubao station wherein users can connect to the MRT3, and to Santolan station (East terminal). It has a total length of 13.8 kilometers.

Comparing to the LRT1 and the MRT3, the LRT2 features more advanced systems. It boasts a fully automatic train system (i.e. no driver required to drive the train), it has CCTV cameras everywhere to control security and flow, it has bigger and wider cars which can accommodate 1,628 passengers per train, and it is more elderly and disabled friendly with elevators in every station as well as braille tactile along the platform and elevators. The LRT2 is also more systematized compared to its counterparts wherein trips are scheduled and electronic information is also available.

Similar to the MRT3 and the LRT1 ticketing types, the LRT2 also has two types of tickets. Single journey ticket cost 12.00 Pesos to 15.00 Pesos (approximately 9.00 Baht to 11.00 Baht) as shown in Figure 2.8. The stored value ticket cost 100.00 Pesos (70.00 Baht) with similar mechanics as the stored value cards of the LRT1 and the MRT3.

The capacity of the LRT2 is yet to be reached at an average of about 200,000 daily passengers.

Table 2.2 LRT2 Fare Table (LRTA, 2013b)

LRT LINE 2				
Distance (no. of inter-stations)	1-3	4-6	7-9	10
Single Journey or Stored Value Ticket Fare (Pesos)	12	13	14	15

2.2.2.4 Future Plans of the Metro Manila Urban Rail Systems

At the term of President Benigno Aquino III, several transportation projects are planned and undergoing including the North-South Skyway which will connect the two major freeways in the country, which are the South Luzon Expressway and the North Luzon Expressway. Several projects on the urban rail system are in line as well.

A fare increase in the all urban rail systems is undergoing studies. The Department of Transportation and Communication (DOTC), Light Rail Transit Authority (LRTA), and the Metro Rail Transit Corporation (MRTC), have agreed to fare increase. All three lines are operating at a loss due to the subsidized transit fare. According to the LRTA, their systems are have lost 4.7 billion Pesos during 2012, while the MRTC lost 7.2 billion Pesos. This is because the LRTA shoulders 59% of the costs in the LRT lines and only 41% is being paid by commuters. In the MRT3, 77% is being shouldered by the government, while only 23%

is being paid by commuters. A “11+1” formula is proposed because of this. This means that 11.00 Pesos will be paid by the commuters for entering the station, and a 1.00 Pesos additional payment is added with every kilometer travelled (DOTC, 2013).

Extensions and developments are also being planned for all three urban rails in the Metro Manila. The MRT3 will be providing information systems to the passengers. A common ticketing system for all three systems will be implemented to eliminate the queues in ticketing machines. A new “tap and go”, similar to the smart passes in Hong Kong, Japan, etc., will be applied to all three systems. Extensions to the south of the LRT1 is now underway that will possibly serve 500,000 more passengers, with this; additional Light Rail vehicles (LVR’s) will be added to both the MRT3 and the LRT1 to alleviate the congestion of passengers in the system. The LRT2 will also be extended eastward. Lastly, a new system is undergoing feasibility studies called the MRT7 wherein the North Avenue station of the MRT3 will be connected to the MRT7 which will go all the way to Bulacan, which is a populated province outside Metro Manila.

2.3 Price Elasticity

The definition of elasticity is the measurement of how responsive an economic variable is to a change in another. Price sensitivity is also a definition of elasticities, where the price of a product affects the consumers purchase decisions. One basic example is, when a price is increased this will lead to less usage of the product or a shift to another alternative.

There are three kinds of elasticities depending on the value, namely, elastic, inelastic and unit elastic. An elasticity value of 1 means that it is unit elastic, wherein the price change is proportional to the change in consumption. It is inelastic if the value is less than 1 where the price change causes less proportional change in consumption. Lastly, it is elastic when it is greater than 1 which means that a price change causes greater proportional change in consumption.

When an elasticity value has a negative sign, this means that price and consumption are inversely related and vice versa if it is positive, for example, the increase in fare will result to a decrease in patronage. If the value ranges from zero to negative one, this means that a price increase leads to an increase in revenue, on the other hand, if the value is more than negative one, it will result to a decrease in revenue.

In terms of fare, the concept of elasticity is if fare increases, the patronage will decrease (Paulley et al., 2006). It is the ratio of proportional change in patronage to the proportional change in fare. There have been many studies about price elasticities in the transportation sector. Knowing fare elasticity is very important for transit managers since this provides information on the expected ridership and fare box revenue resulting from a proposed fare change (Pham & Linsalata, 1991). This is used when transit managers are pressured to obtain sufficient fare revenues to maintain the quality of service to commuters with minimal help from the government (Pham & Linsalata, 1991). According to Pham and Linsalata (1991), the impact of fare in transit ridership has been an unsettled issue for many decades now, and they also stated that: in the recognized "fare increase results to a ridership decrease", the magnitude of such decrease is difficult to measure and can vary greatly among transit systems. To obtain the elasticity in transit fares, creating a fare elasticity model is used. Another choice is by using the Simpson-Curtin Formula.

The Simpson-Curtin formula has become a rule-of-thumb for many where a 3% fare increase reduces the ridership by 1% or a fare elasticity of -0.33. This has become too simple and too outdated in today's situation. Currently, transit users react more to fare changes than found by the Simpson-Curtin formula since users can have more choices in the long-run, wherein income increases, telecommunication is now available to substitute for physical travel, and increasing automobile ownership (Litman, 2004).

Values of elasticity depend on many factors. They vary overtime, whether a study is done for a short-run period which is 1-2 years, medium-run period which is 5-7 years, or a long-run period. Transit elasticity with respect to a change in fare usually ranges from -0.2 to -0.5 in the short run, while it is -0.6 to -0.9 in the long run (Litman, 2004). Also, the size of a city affects the value of elasticity, for example, transit riders in a small city tend to be more responsive to a fare change than those in large cities. It can also be due to factors like the increase rate of market turnover, new users may have different perceptions on public transport, rising incomes, car ownership, quality of public transport service, etc. Given below are some of the main factors that affect price elasticities (Litman, 2004):

User Type. Transit dependent commuters are more likely to be less price sensitive compared to the choice or discretionary commuters who own automobiles. These transit dependent commuters, which are a small portion of the population but a large portion in transit, are the ones who have low income, who are non-drivers, commuters with disabilities, students and elderly.

Trip Type. Depending on the kind of trip, non-commute trips or off-peak trips have high value of elasticities compared to peak-hour trips where they tend to have lower values of elasticities.

Type of Price Change. A fare increase does not necessarily mean that it will have the same symmetrical change when a fare decrease is made. They will have different effects, again, depending on many factors.

Direction of Price Change. It is said that pricing tends to have the greatest impact on transit ridership compared to all other factors.

Time period. The value of elasticities increases over time because people have more choices in the future.

Transit Type. Transit modes serve different markets.

The determination of price elasticities for rail transit has been done before. It has many applications in rail transport planning wherein it can predict ridership and revenue effects of changes in transit fare. Factors stated above affects the price elasticity value of a rail transit. From the previous studies, it can be said that short trips will have higher elasticity value because the short distance would persuade the commuters to walk instead. On the other hand, increasing distance will tend to have lower rail fare elasticities.

2.3.1 Past Studies using Price Elasticity

There have been various studies that tried to estimate the change in ridership with respect to a change in transit fare using price elasticity. Although the price elasticity and the impact of change in transit fare on ridership has been wide-ranging over the years, studies on urban rail systems of most Southeast Asian countries have been lacking. Since the urban rail system is an emerging trend in the region, these kinds of studies can be helpful for future references. Most of the studies regarding price elasticity for public transport are mostly in Europe and the United States and are based on revealed preference surveys and reviewed studies.

There are many factors that affect the price elasticity in every country and in every mode of transportation studied. The difference will depend on the definitions adopted for the elasticities, the type of good or service, the class of consumer, the quality and quantity of available goods and services, any other market factor that might be relevant in a particular case, but most common factors were already discussed in section 2.2 (de Grange, Gonzalez, Munoz, & Toncoso, 2013).

Bresson *et al.* (2003) analyzed the impacts of fare changes and other factors of the public transit. They compared the elasticities of transit for both England and France. Instead of using the conventional approaches of obtaining the elasticities, a random-coefficient approach and the Bayesian shrinkage estimators are used since data can have heterogeneity. As a result, it was seen that there is variation with the elasticities obtained where a common set of variables were used, a similar time period, and a common methodology. The conclusion for this study is that public transport demand is is sensitive to fare changes and that a subsidy of fare in these countries will have a substantial role in encouraging the use of public transport.

Cervero (1990) used the analysis and summary of previous studies to obtain the price elasticity of transit. Several transit fare changes in North America were considered in his study. According to him most studies on ridership responses to fare changes are relied on the US and emphasis is given to understanding the behavioral responses to the change in transit fare. Thus, his study focuses on the demand side mainly in terms of how ridership and revenue levels are affected by the change in transit fare. His conclusion was that people in America respond more to service improvements compared to change in transit fare according to the elasticities he obtained. For people to shift to public transit it was suggested that the fare increase of a transit should be charged for services.

Goodwin (1992) also obtained the price elasticities from previos studies. He considered studies done in America and in Europe that obtained the price elasticity during the 1980's. From the price elasticity he obtained in bus fare elasticities, it was -0.41 compared to the original study which was -0.3, the petrol consumption price elasticity was -0.1 to -0.4 wherein he obtained a price elasticity of -0.48 in his current time. Goodwin obtained the short-run and the long-run price elasticities since it was not being considered in the previous studies. As for the rail fare elasticities, he obtained a value of -0.79 from the reviewd studies. The rail tend to have higher average elasticities which means that people are sensitive to fare changes in the rail.

Holmgren (2007) uses meta-regression analysis to obtain the price elasticity of previous demand studies, specifically bus demand elasticity. The meta-regression analysis was used to explain the wide variation in elasticity estimates. Since most studies obtain price elasticities where variables are considered to be exogenous (no correlation), Holmgren's study considers these variables endogenous. In his results, he recommends that demand models should include the effects of car ownership, price of fuel, own price, income and some measure of service among the explanatory variables and should be considered as endogenous. Elasticities obtained from his study with respect to level of service, income, price of petrol and car ownership are -0.59, 1.05, -0.62, 0.4 and -1.48 respectively.

Kain and Liu (1999) summarizes and updates the findings form previous studies in transit systems in Houston and San Diego. In these areas a large increase of ridership has been experience after the time of studies were done but the increase in ridership still experience losses in the transit systems. The reason for the losses is because the service was increased but transit fare was reduced. Obtaining the fare elasticity will determine the possible fare increase that can be done. With a fare elasticity of -0.32 for the light rail,

-0.30 for bus during peak hours and -0.46 during off-peak hours, the authorities abandoned the policies of increasing the service levels and reducing real fares. With this, the introduction of rail services was accompanied by increases in real transit fares.

In Belgium, Mayares (2000) applied the general equilibrium model to study the marginal efficiency effects with three transport instruments. These three transport instruments are peak road pricing, higher fuel taxes and higher subsidies to public transport. Focusing on the transit fare changes for public transport, Mayares obtained price elasticities bus and rail using revealed preference. For the bus, tram and metro he obtained a demand elasticity of -0.19 during peak hours, and -0.29 during off peak hours. While for the rail, -0.37 and -0.43 were obtained for peak and off-peak, respectively. In conclusion, higher subsidies to public transport lead to welfare loss (A situation where marginal social benefit is not equal to marginal social cost and society does not achieve maximum utility), regardless of which they are financed.

Romilly (2001) studied the subsidy and local bus service deregulation in Britain (excluding London). The bus vehicle kilometers increased after the deregulation but the passenger journeys went down and the bus fares increased. The decrease of ridership and the increase in fare was cited as evidence of the failure of the deregulation to promote the public transport. The study uses an econometric model in which the role of subsidy reduction is introduced in a price-markup equation. The model can be used to generate forecasts in bus fares and ridership after subsidy. After running the model a fare elasticity for bus was obtained to be -0.38. This led to the conclusion that a fare subsidy will increase the gains.

In summary, after various studies in price elasticity of public transit, it was found that short-run elasticity ranges from -0.2 to -0.8 and that the long-run can reach double the short-run estimates. A bus fare elasticity is found to be ranged from -0.4 in the short-run, -0.56 in the medium run, and -1.0 in the long run. While the urban rail price elasticity on the other hand averages about -0.3 in the short run and -0.6 in the long run (Sharaby & Shiftan, 2012). Again, these values are based from a different city setting, hence, a study on Bangkok and Manila can be different from these past studies.

2.4 Development of Kishi's Logit PSM

2.4.1 Willingness to Pay

The Willingness to Pay or the WTP is the maximum price a consumer is willing to pay to consume a good. The willingness to pay reflects the value of the benefits that the consumers receive from good consumption. This study aims to determine the commuter's willingness to pay for the transit fare of urban rail systems in Bangkok and in Manila. As reflected by the demand curve, there are more consumers with high willingness to pay and more consumers with low willingness to pay. An individual's demand is defined by his/her utility, purchasing power, and ability to make a purchasing decision.

2.4.2 Price Sensitivity Measurement (PSM)

According to Kishi and Satoh (2005), the method of PSM measures the consumer's perceptions of a price, or in this study's case, the transit fare. The PSM tries to evaluate the perception of the consumers by giving prices that are "reasonable", "expensive", "too expensive to buy", and "too cheap to buy". This method has been developed to find solutions through psychological approach to pricing issues concerning consumer's price sensitivity and acceptability.

In the PSM, consumers are asked to give a price to a product at four different levels. First, "Reasonable" price, in this level the consumer is asked what the reasonable price is to purchase a certain product. Second is "Expensive" price, in this level the consumer is asked what he/she thinks is an expensive price to purchase the product. Third is the level "Too expensive to be willing to buy" where consumers are asked what is their maximum amount of money they are willing to pay for the product. Lastly, is "Too cheap to be willing to buy" where consumers are asked the minimum amount that they are willing to pay for the product but still keeping in mind the quality of service when price is too low. Figure 2.7, summarizes the price sensitivity of the product as well as the PSM questions. It gives the range of the prices consumers would still pay based on the 4 levels of the PSM questions.

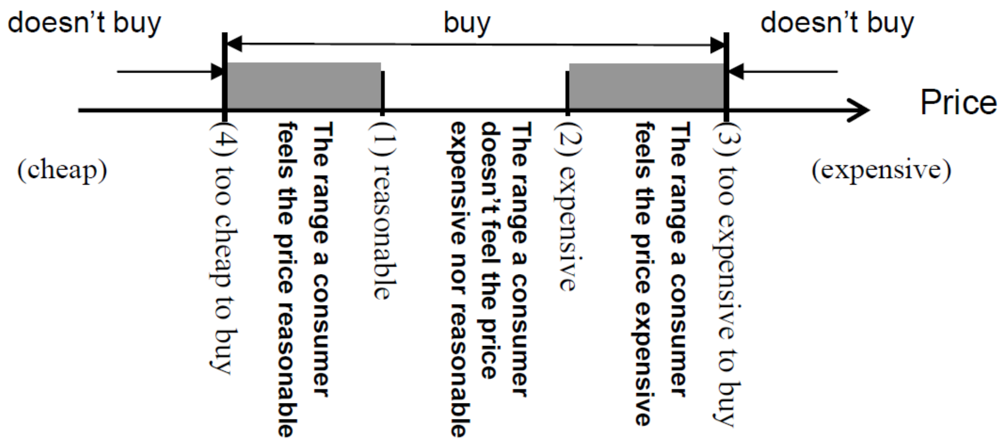


Figure 2.7 Consumer's price sensitivity from PSM questions (Kishi & Satoh, 2005)

From the data that will be gathered from the PSM questions, frequency distributions will be analyzed and relative cumulative frequencies will be graphed as seen in Figure 2.8. The levels "Reasonable" and "Too cheap to be willing to buy" are plotted as decreasing curves, while "Expensive" and "Too expensive to be willing to buy" are plotted as increasing curves.

Complementary events of "Reasonable" and "Expensive" will then be plotted as well as shown in Figure 2.9 and Figure 2.10, respectively. With this, the intersections in the graph will be the basis of the price indicators in PSM. Complementary event of "Reasonable" will be called "Should be less expensive" and complementary event of "Expensive" will be called "Should be more expensive".

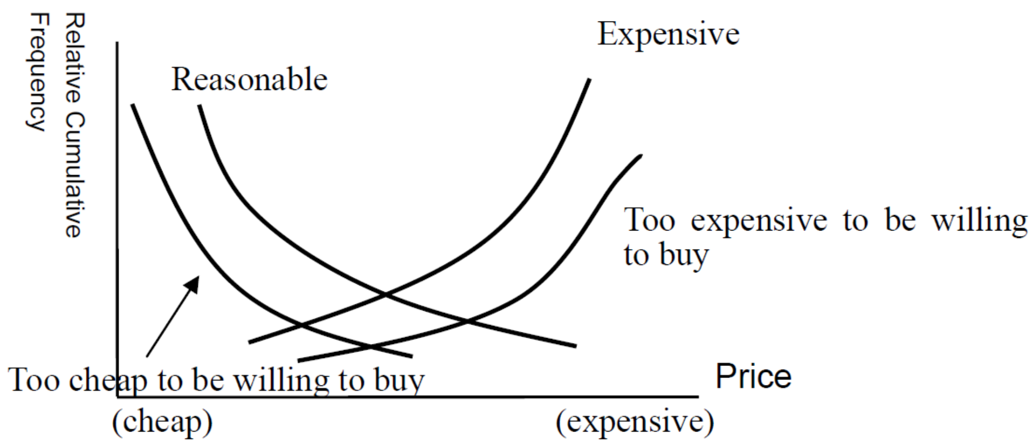


Figure 2.8 Relative Cumulative Frequencies of the 4 Levels in PSM (Kishi & Satoh, 2005)

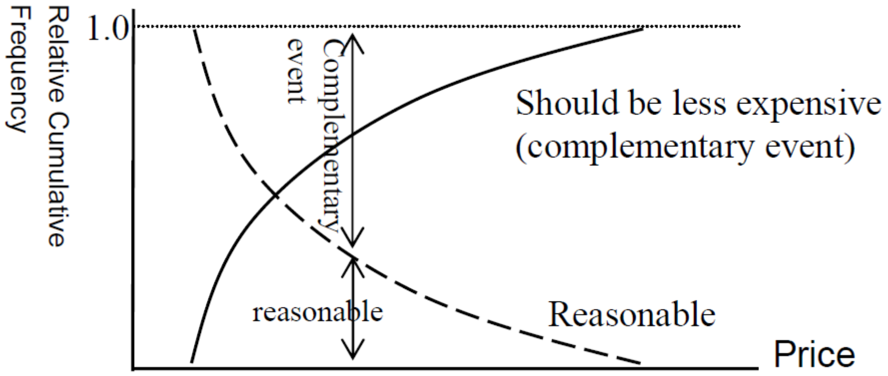


Figure 2.9 Complementary event of “Reasonable” (Kishi & Satoh, 2005)

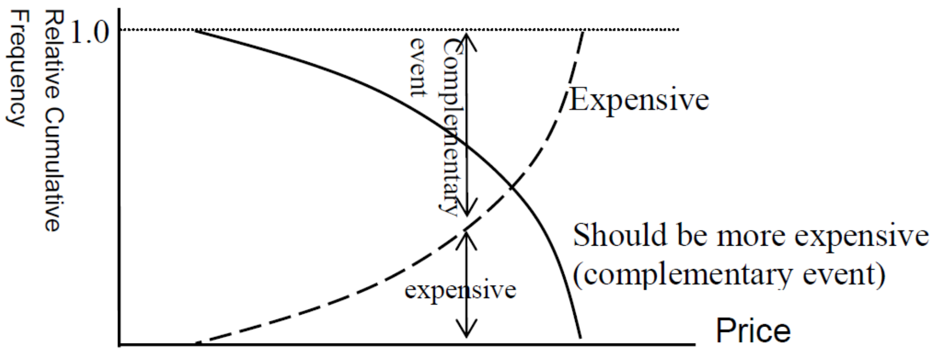


Figure 2.10 Complementary event of “Expensive” (Kishi & Satoh, 2005)

2.4.3 Kishi’s Logit PSM (KLP)

The PSM method could not evaluate prices stated by respondents which are not in the price range, hence, Kishi’s Logit PSM (KLP) improved the PSM by applying the four relative cumulative frequencies that are regressed by using the logit model as shown in equations (1) and (2). As a result, a dependent variable will be equal to the relative cumulative frequency when the value is between 0 and 1. Since the logit model is a continuous function, it can then analyze any price range stated by respondents. Figure 2.9 shows the resulting price indicators after adjusting the PSM.

$$T_i = \frac{1}{1 + \exp F_i(x)} \tag{1}$$

$$F_i(x) = ax + b \tag{2}$$

Where:

T_i = relative cumulative frequency

x = price

T_1, F_1 = should be less expensive

T_2, F_2 = should be more expensive

T_3, F_3 = too expensive to be willing to buy

T_4, F_4 = too cheap to be willing to buy

From the price indicator of the KLP in Figure 2.11, several points are considered as important, which are: Minimum price (P1), Reasonable price (P2), Standard price (P3), and Maximum price (P4).

In the Minimum price (P1), the curves “should be less expensive” and “too cheap to be willing to buy” is considered. At a high price, consumers think that it should be less expensive but as the price is discounted, it comes to a point where the price then becomes too cheap for consumers to buy because the quality will deteriorate at a very cheap price, hence, the intersection of these two curves is the minimum price.

For Maximum price (P4), the curves “should be more expensive” and “too expensive to be willing to buy” is considered. Similar to the Minimum price (P1), the lower price means that consumers can pay for more for the product, but as the product becomes too expensive, it becomes too expensive to be willing to buy. The intersection of both of these curves represents the maximum price for the entire consumer population. Here, consumers are more leaned to the price rather than the quality of the product.

Next is the Standard price (P3), curves considered are “Should be less expensive” and “Should be more expensive”. Here, the intersection of both curves means that the number of consumers that agrees to both opinions is the same. The entire consumer population in this intersection indicates that the price is neither expensive nor cheap. The Standard price represents the point where the product quality and the price are well balanced.

Last is the Reasonable price (P2), which considers the curves “too cheap to be willing to buy” and “too expensive to be willing to buy”. As discussed in the PSM method these two curves are the maximum and minimum amounts that a consumer is willing to pay for the product. The intersection represents the price which is the border to differ consumer's motivational factor for "not to be willing to buy a product" from "doubts about the quality", to "too expensive price". The intersection indicates the reasonable price which can be defined as the price which consumers perceive reasonable considering the quality.

The Minimum price (P1) and the Maximum price (P4) is the acceptable price range of consumers. This is the basis for the distributors in choosing an acceptable price for the entire consumer population.

The sense of Reasonability indicates that the range from the Standard price and the Minimum price is the most reasonable range for the entire consumer population.

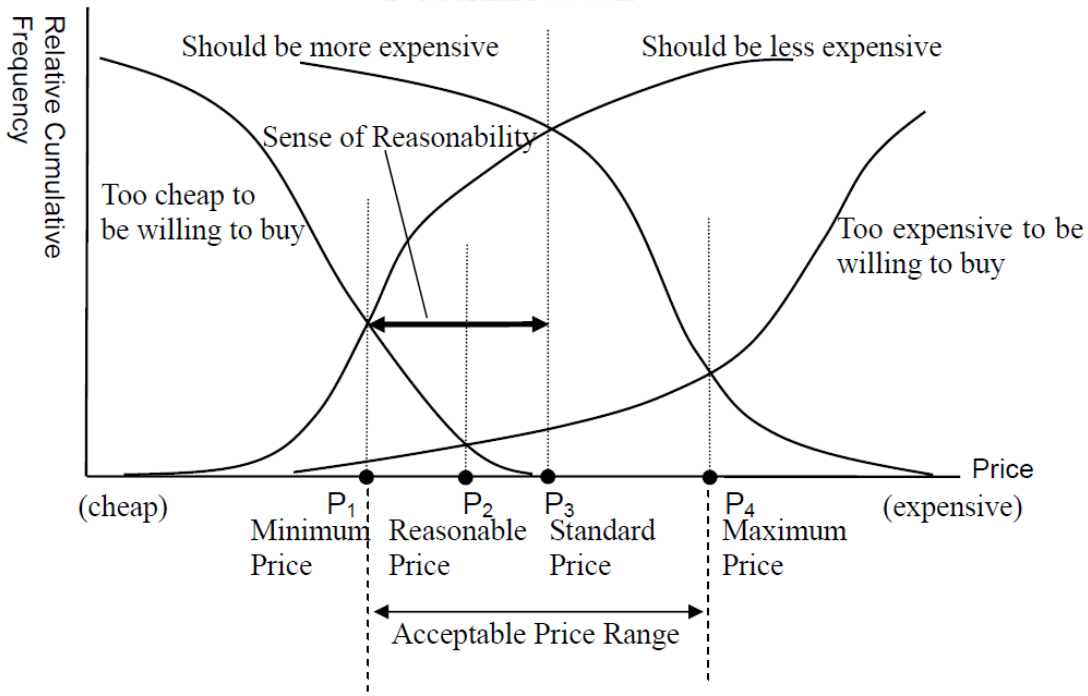


Figure 2.11 KLP Price Indicator Reference (Kishi & Satoh, 2005)

2.4.4 Application of KLP

KLP can be helpful in setting a standard in pricing. Consumers usually weigh the price of the product with the benefits they get from it. A price too high in the thinking of a consumer will lead to not buying the product, on the other hand, if the price is too low in the thinking of the consumer, they will doubt the quality of the product. The KLP will enable to develop future marketing strategies by comparing set prices from a KLP analysis.

Also from the KLP price indicator reference, it has the capability to show two different kinds of market in where the product belongs. The two markets are the discounted market and the premium market as shown in Figure 2.12. With this, the KLP can determine the market size.

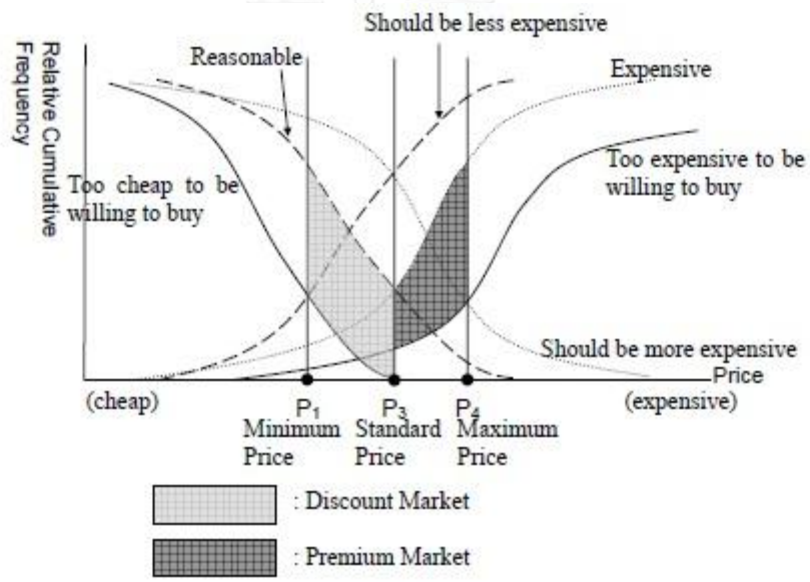


Figure 2.12 Estimation of Market Size by KLP (Kishi & Satoh, 2005)

The discounted market is in the range of the minimum price and the standard price wherein the range of “Reasonable Price” is removed as seen in Figure 2.12. These groups of consumers are the ones who feel that price range reasonable to buy the product. By multiplying the price with the potential consumers in the discounted market, it will give the potential sales volume.

The other kind of market, which is the premium market, is in the range where the price is in between the standard price and the maximum price where “reasonable price” is removed as seen in Figure 2.12. The types of goods in these markets are the brand-name goods. Consumers in this market buy products despite the feeling of the product being expensive. Again, multiplying the price with the potential buyers in this market will give the total sales volume.

2.4.5 Studies using the KLP

A study done by Kishi and Satoh (2005) applied KLP to evaluate low-pollution car prices such as the hybrid cars. A comparative study was done in both Sapporo and Tokyo in Japan concerning the reduction of CO_2 emissions. The promotion of low-pollution cars in Japan is being done by the government, hence; survey questionnaires were made and distributed in Tokyo and Japan to identify the status of people's willingness to buy a low-pollution car. The evaluation the low-pollution car prices were done by Kishi's Logit PSM. After analysis was done, they have found from the KLP that there are only a few hybrid cars where people think the prices are reasonable.

A study done by Iwadate, Nakatsuji, and Kishi (2013) applied KLP to evaluate the toll and the value of safety in a newly built highway between the cities of Obihiro and Sapporo in Hokkaido, Japan. In their study, instead of using the four (4) PSM questions, they disregarded the question "too cheap to be willing to buy" since it is not applicable in their study. Regardless of this, they were still able to obtain the Maximum price and the Standard price from the indicators of the KLP. Survey questionnaires were distributed in several areas between both cities. After evaluation, the KLP indicates that the standard price is 2881 yen and the maximum price is 3874 (Note that these prices are obtained from the preference of the highway users which was evaluated using KLP). The real price of the toll during the study was 4250 yen, which means the real price is higher than what people want. About the results of the value of safety after using KLP, 3186 yen was the standard price and 4288 yen was the maximum price. The results are higher than the KLP analysis; hence, people appreciate the value of safety of using the highway. With the given prices from KLP, it can be a basis for the highway operators to consider the prices which would eventually lead to higher highway patronage.

2.5 Past Studies on Improving the Quality of Urban Rail Systems in terms of Transit Fare

There have been many studies regarding the improvement of quality of the urban rail in with respect to transit fare around the world, but very few has been done in Thailand especially the Philippine urban rail. In every city setting, there will be different results regarding the improvement of urban rail in countries. This is because there are so many factors in every country that affect the results; for example, the income of people in every country is different, which affects their decisions in transit fare (Paulley et al., 2006).

In Bangkok, Sriroongvikra, Choocharukul and Fujii (2008) studied the effectiveness of having price incentives in the MRT for the university students given that they have an available car. Their main objective was to investigate the travel mode shift and attitude changes of the students given the price incentives for the MRT. Price incentives given to the students were “free ride”, and “half price”. Students were grouped depending whether they always drive to school and the other group are the students who drive but also use the urban rail system to school. From the two groups, selected students were given the free ride incentives, the half price incentives, and the some did not receive any incentives at all. For the results not to be biased, 3 study periods were done, first was the pre-intervention wherein the current travel behavior of students were observed, second is the intervention period where incentives were given, and third was the post-intervention period to see whether the students’ travel behavior changed after intervention. The results obtained is that captive drivers who were introduced to the urban rail were more inclined to use the system after intervention regardless of what incentive, while those students who sometimes drive and use urban rail have no significant change in patronizing the urban rail. In conclusion, behavioral change to public transport is possible through temporary structural change such as providing transit incentives.

2.6 Summary

With the same city setting, Bangkok City and Metro Manila which operates three lines of urban rail transit systems in each city, this study would want to investigate the factors that will be affected when a change in transit fare is made. Both cities have different quality of urban rail systems as well as transit fares, which leads to difficulties. There have been few studies regarding the improvement of the quality of service of urban rail in Bangkok especially in Manila focusing on the effects of transit fares. Using the concept of price elasticity and Kishi's Logit PSM, the study will be able to see the changes in commuter's travel behavior as well as the price urban rail users would prefer.

Since there have been many studies already done regarding price elasticity in many European and American countries, this study would want to investigate the results in developing countries (In this study's case, Bangkok City and Metro Manila).

Kishi's Logit PSM (KLP) is a method that can give a Figure in terms of price in any transport problem that lacks the clarity of a good pricing range. Obtaining the prices from the commuters' preference through a questionnaire survey, the KLP can estimate a range of prices.

Chapter 3
Methodology

3.1 General

In order to accomplish the objectives of this study, several methods were used. The review of the current urban rail systems in both Bangkok City and Metro Manila was done. A questionnaire survey was designed based on the Price Sensitivity Measurement (PSM) method which includes the socio-economic profile of users. A pilot survey was done to test the validity and effectiveness of the questions designed which will lead to the design of the main survey. From the descriptive statistics, a logistic regression model was used to determine the price elasticity and the other factors affected from a change in transit fare. Lastly, Kishi's Logit PSM (KLP) was used to determine the reasonable price of the urban rail system in Bangkok City and Metro Manila based on the conducted survey.

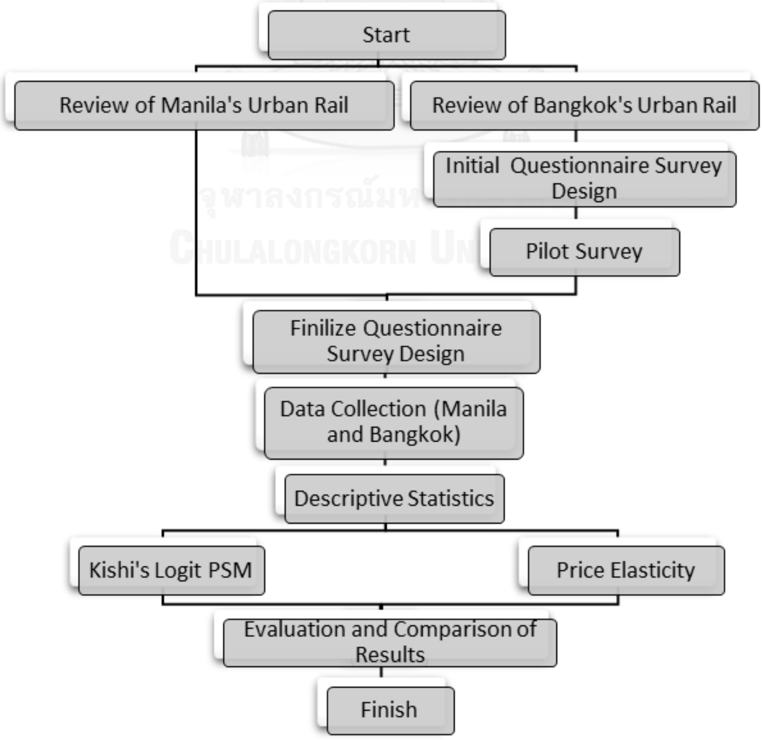


Figure 3.1 Research Design Flow

3.2 Questionnaire Survey Design

3.2.1 PSM based Questionnaire

To obtain the data needed in this study, a questionnaire was designed based on the Price Sensitivity Measurement (PSM) method. A total of twenty one (21) questions were asked in the initial design of questionnaire. First, socio-economic and other personal questions were asked in the first part of the questionnaire, which includes the respondent's gender, age, marital status, occupation, monthly income, household members, household income, numbers of cars owned, and number of motorcycles owned. Next, urban rail transit information was asked including the respondent's frequency of use of the urban rail system, the kind of ticket used, their usual origin stations, their usual destination station, usual purpose of the trip, whether they transfer to other urban rail systems, and their overall satisfaction on the urban rail transit system in their city.

The last part in the questionnaire asks questions about the four prices in PSM which are "Reasonable", "Too expensive", "Too expensive to be willing to buy", and "Too cheap to be willing to buy". Refer to section 2.4.1 for a more detailed explanation on the PSM method.

For the "reasonable" question, it was based on the current amount they pay during their usual trip, wherein respondents were asked if what they pay is reasonable, and if not, they were asked to suggest a reasonable fare. For the "too expensive" question, respondents were requested to suggest an amount which they think makes the fare expensive but will still ride. For the "too expensive to be willing to buy" question, respondents were asked the maximum amount they are willing to pay to ride the urban rail transit based on their usual trip. For the last question, "too cheap to be willing to buy", respondents were asked the minimum amount they were willing to pay to ride the urban rail system but keeping in mind that quality of the urban rail will deteriorate with a very low transit fare.

The four prices of PSM should correlate with each other as shown in equation 1. After the relative cumulative frequency of the four prices are obtained a graph will be established as shown in Figure 3.2.

Too cheap to be willing to buy $\leq$ Reasonable $<$ Expensive $<$ Too expensive to be willing to buy (1)

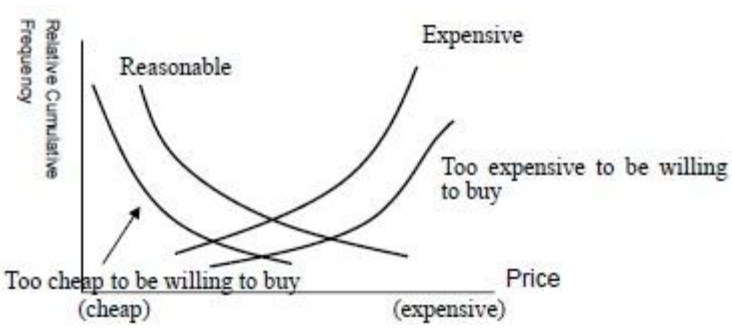


Figure 3.2 Relative Cumulative Frequency of Four prices of PSM

3.2.2 Determination of Sample Size

To determine the sample size of respondents to be interviewed, the Yamane formula was used, as shown in equation (2) and we accepted an error (e) of 5%. Using the average daily ridership (See Table 1.1) for every urban rail transit as the population size (N), we obtained a sample size (n) of 400 samples per urban rail transit. 500 samples per train were targeted to compensate errors done by surveyor or respondent. With a total of 6 urban rail transit systems in both locations, a total of 3000 surveys were targeted.

$$n = \frac{N}{1 + Ne^2} \tag{2}$$

3.3 Kishi's Logit PSM (KLP)

In order to obtain a standard in the price setting of the urban rail transit, the KLP will be used. From the four prices in PSM questions were asked during the survey period regarding the willingness to pay of urban rail users (discussed in section 3.2). Consumers often weigh the quality of the service and the benefits they get against the price. With the

KLP, it enables to develop future marketing strategies by associating the results obtained from the KLP.

Using the four prices of PSM obtained from the survey, the relative cumulative frequency are graphed using the logit models shown in equations (3) and (4). Using these logit models would convert the prices "Reasonable" and "Expensive" to their respective complementary events, which will then be called "should be less expensive" and "should be more expensive".

$$T_i = \frac{1}{1+\exp F_i(x)} \quad (3)$$

$$F_i(x) = ax + b \quad (4)$$

Where:

T_i = relative cumulative frequency;

x = price;

T_1, F_1 = should be less expensive;

T_2, F_2 = should be more expensive;

T_3, F_3 = too expensive to be willing to buy;

T_4, F_4 = too cheap to be willing to buy.

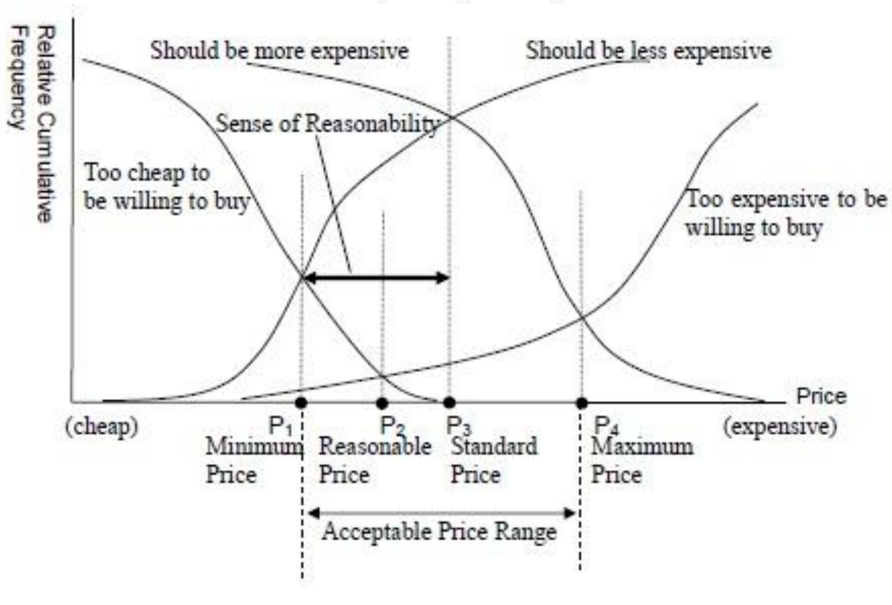


Figure 3.3 KLP price indicator

After the relative cumulative frequencies are obtained from the logit models, these values are graphed as shown in Figure 3.3. The intersections of the four prices established on the graph are the reference price indicators of the KLP.

The intersection of the prices “Too cheap to be willing to buy” and “Should be less expensive” represents the minimum transit fare (P1). The minimum transit fare represents the intersection of the two prices “should be less expensive” and “too cheap to be willing to buy” is because once the transit fare is increased users will feel that it needs to be lowered, on the other hand, if the transit fare is lowered users will feel that it is too cheap which will lead to doubts about the quality of the system.

The intersection of the prices “Too cheap to be willing to buy” and “Too expensive to be willing to buy” represents the reasonable transit fare (P2). It is the reasonable transit fare because there will be more users who will feel that it is “too expensive to be willing to buy” compared to those who think it is “too cheap to be willing to buy” if the transit fare is higher than what is indicated by the intersection, and vice versa. The reasonable transit fare represented by the intersection is defined as a transit fare which users perceive as a reasonable price considering the quality.

The intersection of “should be more expensive” and “should be less expensive” represents the standard transit fare (P3). The reason for this is that users who say the transit fare is reasonable and too expensive are equal, hence, it basically means they perceive the price as neither expensive nor reasonable.

Lastly, the intersection of “should be more expensive” and “too expensive to be willing to buy” represents the maximum transit fare (P4). Transit fares that will exceed this point is when users will not purchase a ticket for their usual trip. The maximum transit fare is based on the user’s transit fare conscious considerations.

The range of P1 to P4 is considered to be the acceptable price range. This price range of the transit fare is the only range where people are willing to pay to ride the urban rail. Once the transit fare is set lower than P1 or higher than P4, there would be less people patronizing the urban rail system. When the price of the transit fare is set in between the minimum price and the standard price, it is called the “sense of reasonability”. This is where most users feel that the transit fare that falls in this range is reasonable.

3.4 Price Elasticity

When a change in transit fare is implemented in any public transit, the most common method to determine the effects of the change is to determine the price elasticity. Other factors were considered in estimating the price elasticity with respect to a change in transit fare such as the urban rail user’s gender, age, occupation, income, purpose of travel, marital status, and car/motorcycle ownership.

Using the software SPSS, a linear regression model was executed. The most common method of estimating elasticity is by defining a log-log relationship between the variables of interest (Litman, 2012). With a log-log function, elasticity values are the same at all fare levels whether it is high or low which is appropriate for this study since transit fare in Manila is low compared to the transit fare in Bangkok. The model is formulated as shown in equation 5.

$$\log(y_i) = \beta_0 + \beta_1 \log(x_1) + \varepsilon \tag{5}$$

After running the model in SPSS wherein the dependent variable (y_i) is the demand, and the explanatory variable (x_i) is the choke price or highest amount the user is willing to pay, the parameters β_o and β_1 will be obtained. To find the elasticity the marginal effects are first obtained by solving for y and then differentiating with respect to x as shown in equations (6) and (7). The marginal effect is shown in equation (8).

$$\mathrm{y_i} = e^{\beta_0 + \beta_1 \log(x_i) + \varepsilon} \tag{6}$$

$$\frac{d(y_i)}{d(x_1)} = \frac{\beta_1}{x_1} e^{\beta_0 + \beta_1 \log(x_1) + \varepsilon} = \beta_1 \frac{y_i}{x_1} \tag{7}$$

$$\frac{d(y_i)}{d(x_1)} = \beta_1 \frac{y_i}{x_1} \tag{8}$$

From equation (7), solving for β_1 will get the elasticity. To interpret the model, if x goes up by 1% on an average, y goes up by β_1%.

3.5 Pilot Survey

A pilot survey was done to see the validation, clarity and effectiveness of the questions asked as well as the procedures and techniques in order to further improve the main survey questionnaire. Instead of doing a pilot survey with all 6 urban rail systems in Bangkok and Manila (BTS, ARL, MRT, LRT1, LRT2, MRT3), it was only done with the BTS sky-train. The train stations where the survey happened were at Siam Station, Victory Monument Station, Asoke Station, and Mochit Station, since these are the stations which are observed to be destination and origin stations. The pilot survey was done on March 6, 2014 and March 7, 2014, a Thursday and a Friday from 16:00 to 20:00 which is considered peak hours in Bangkok.

In total, 500 samples were expected from the pilot survey, but the estimation of respondents per hour was not met. An estimation of 20 to 25 respondents per hour which is about 2 minutes per respondent with a little spare time was expected, rather, 5 minutes per respondent was observed which averaged 10 questionnaire per hour. A total of 443 survey questionnaires were obtained from the two days of data gathering which is above the required 400 samples from the Yamane formula. After filtering the reliable survey questionnaires, 434 were found to be reliable, which is 98% of the original. The high reliability of returned survey questionnaires was because the data gathering was done face-to-face by interviewer and the respondents. There were a total of 5 people who conducted the survey for each day.

Questions asked in the pilot survey are discussed in section 3.2, which includes the socio-economic, urban rail transit information and the four prices in PSM questions. The survey team members were informed beforehand about the questions and strategies to be done. They were also informed to control some of the variables, for example, the number of female respondents must be as much as possible similar to the number of males and same goes for the number of students versus the number of workers. Since the pilot data was done in Bangkok, the original English survey questionnaire was translated into Thai.

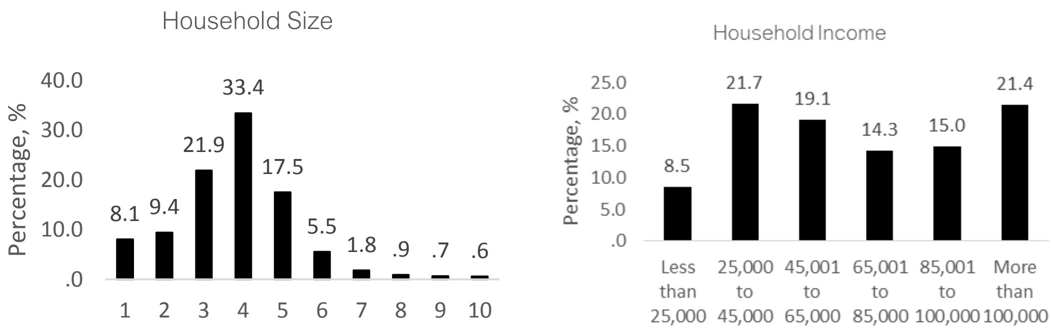
3.5.1 Socio-Economic Characteristics

There were a total of 434 survey questionnaires included in the descriptive statistics. Table 3.1 shows the summary of the socio-economic characteristics during the pilot survey. For the gender, 43.3% of respondents were male, while 56.7% were female. Most respondents were at the age group of 19 to 25 years old and 26 to 35 years old which are 41.2% and 30.0%, respectively. 81.8% of the total respondents were single, while 17.3% were married. For the occupation, 56.4% of respondents were already working, 39.6% were students, and the last 3.9% falls in to “others”. For the monthly income of respondents, they were quite distributed 25.1% had monthly income of less than 9,000Baht, 21.7% earn 9,000 to 15,000Baht, 31.6% earn 15,001 to 30,000Baht, 16.4% with 30,001 to 50,000 Baht, and 5.3% had more than 50,000Baht.

Table 3.1 Summary of Socio-Economic Characteristics from the Pilot Survey

Variable	Label	BTS (Bangkok) Percentage
Gender	Male	43.3
	Female	56.7
Age Group	18 and Below	11.1
	19-25 years old	41.2
	26 to 35 years old	30.0
	36 to 50 years old	13.4
	Over 50	4.4
Marital Status	Single	81.8
	Married	17.3
	Others	0.9
Occupation	Student	39.6
	Employee	44.7
	Business Owner	5.5
	Independent Professional	6.2
	Others	3.9
Income	Very Low	25.1
	Low	21.7
	Medium	31.6
	High	16.4
	Very High	5.3

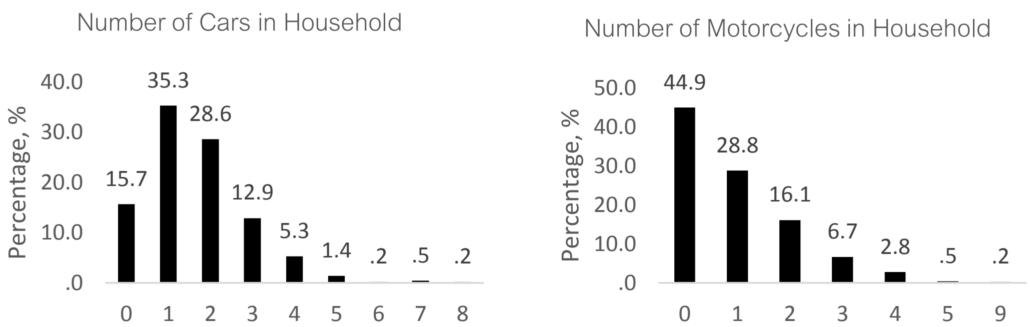
Figure 3.4 shows the distribution of the respondents' household information. In Figure 3.4a, the highest percentage of household size is 33.4% wherein there are 4 members in the household. Household income tends to be more distributed where 21.7%, 19.1%, and 21.4% have household incomes of 25,000 to 45,000Baht, 45,001 to 65,000Baht, and more than 100,000 Baht, respectively, as seen in Figure 3.4b.



(a) (b)

Figure 3.4 Distribution of Household Information from the Pilot Survey

Figure 3.5 shows the distribution of cars and motorcycles in a household. It can be observed in Figure 3.5a that 35.3% of respondents own one car, 28.6% own two cars. In Figure 3.5b, 44.9% of the respondents do not own a motorcycle, while 28.8% of them own one.



(a) (b)

Figure 3.5 Distribution of Number of Vehicles from the Pilot Survey

3.5.2 Urban Rail Transit Information

Table 3.2 summarizes the urban rail transit information of the respondents. It can be seen that 53.5%, 26.3%, and 20.3% of respondents ride the urban rail often, sometimes, and rarely, respectively. For the ticket type, 44.9% of them use the single journey ticket, 23.5% uses the stored value ticket, while 31.6% uses the period pass. For the purpose of travel, 76% of the respondents use the urban rail to go to work or school, and the other 24% uses the urban rail for leisure. Since there are a number of mass transit connected to the BTS, respondents were asked if they connect to these transit systems (MRT/ARL/BRT), about 72% of them do not connect while 28% connect to the other transit systems. Lastly, the satisfaction on the overall BTS experience was asked and a large percentage feel that they are very satisfied and moderately satisfied with 48.8% and 43.1% respectively.

Table 3.2 Summary of Urban Rail Transit Information from Pilot Survey

Variable	Label	BTS (Bangkok) Percentage
Frequency of Use	often	53.5
	rarely	20.3
	sometimes	26.3
Ticket Type	Single Journey	44.9
	Stored Value	23.5
	Period Pass	31.6
Purpose of Travel	Work/School	76.0
	Leisure	24.0
Connect to other transit system	Yes	28.1
	No	71.9
Satisfaction	Extremely Satisfied	5.3
	Very Satisfied	48.8
	Moderately Satisfied	43.1
	Slightly Satisfied	2.5
	Not at all Satisfied	.2

From the usual origin and destination stations that was input by respondents, Table 3.3 shows the summary in percentage of their origin and destination stations. At

24.7% and 19.8%, it is observed that Mochit Station and Victory Monument Station are most likely considered as the origin station out of all the stations. On the other hand, Siam Station is where most of the respondents disembark from the BTS which is 41.5% of the total respondents.

Table 3.3 Summary of Origin-Destination Stations of Respondents

Stations	Origin Station in Percentage	Destination Station in Percentage	Stations	Origin Station in Percentage	Destination Station in Percentage
Asoke	6.2	11.3	Phram Phrom	.5	.9
Ari	2.1	1.4	Punnawitthi	.7	.2
Bangna	.9	.5	Ratchathewi	1.4	1.2
Bang Chak	.9	.0	Ratchadamri	.2	.5
Bearing	2.3	1.2	Siam	5.8	41.5
Bangwa	2.3	.2	Sala Daeng	1.4	3.0
Chong Nonsi	1.4	3.7	Saphan Kwai	1.8	.7
Chit Lom	.2	2.3	Silom	.5	.9
Ekkamai	.5	.5	Sanam Pao	1.6	.2
Krung Thon Buri	.9	.0	Surasak	.7	.9
Mochit	24.7	7.8	Saphan Taksin	1.8	.5
Nana	.9	.9	Thalat Phlu	1.2	.2
National Stadium	1.2	.2	Thong Lo	1.6	.7
Onut	2.3	.5	Udomsuk	3.9	.5
Phayathai	2.3	4.4	Victory Monument	19.8	8.8
Phloen Chit	.9	3.5	Wong Wian Yai	5.5	.5
Phra Kanong	1.2	.5	Wutthakat	.5	.2

3.5.3 Four Prices of PSM

From the transit fare amount paid by commuters, data were filtered to obtain the most popular ticket price range to be able to apply Kishi's Logit PSM. Table 3.4 shows that most commuters pay 25 Baht and 42 Baht to for a ticket, hence, these are used to analyze. The ticket prices 25 Baht and 24 Baht are combined to get a total of 19.1% (83 out of 434) of the total tickets bought, and same was done with the 42 Baht and 41 Baht ticket prices which is 22.6% (98 out of 434) of the total. They were combined since the fare using a stored value card is just 1 Baht less the single journey tickets.

Table 3.4 Percentage of tickets bought in terms of the Amount Paid by commuters

Amount Paid for a ticket	Percentage of buyers	Amount Paid for a ticket	Percentage of buyers
14	.2	30	1.2
15	2.1	31	8.1
16	.5	32	1.8
17	.2	33	.7
18	.2	34	3.9
19	2.3	35	2.1
20	1.8	37	3.0
21	3.0	40	.7
22	5.1	41	3.0
23	6.7	42	19.6
24	1.6	43	.2
25	17.5	45	.9
26	.2	50	.2
27	2.3	51	.2
28	3.9	52	5.8
29	.7	55	.2

3.6 Main Survey

After a successful pilot survey no changes were done with the initial survey questionnaire. Techniques on how to approach respondents and how to ask questions for a better and faster data gathering were learned. With the learnings form the pilot survey, a higher percentage of reliable data were obtained for the main survey. 3000 respondents were targeted for the whole research which distributes to 500 survey questionnaires for every urban rail system and 2799 questionnaires were attained and were reliable. Note that some variables were controlled to get a more distributed data set (e.g. Gender and Occupation).

3.6.1 Manila Data Collection

The main survey was conducted from June 16, 2014 to June 20, 2014 to complete the data collection for the three urban rail systems in Metro Manila, Philippines. A total of

8 people were needed to complete the survey for all three trains. Surveyors stationed near the premises of the busiest urban rail stations. The English version of the questionnaire was used.

For the MRT3, out of the 500 target surveys 499 surveys were reliable. The MRT3 traverses on the busiest highway in the Metro which consist of schools, and several central business districts. A mix of different commuters were surveyed since this line is the most popular line.

Both the LRT1 and the LRT2 traverses around the University Belt of Metro Manila. This means that most respondents are students who use the systems. For the LRT1, out of 500 surveys done 496 surveys were reliable. As for the LRT2 data, 483 out of 500 were reliable.

3.6.2 Bangkok Data Collection

Bangkok main survey was conducted on several dates. BTS data were obtained from the pilot survey. For the MRT data collection it was conducted on September 23, 2014 and September 24, 2014. Two days were enough to complete the data collection for the MRT. The data collection for the ARL was conducted on November 10, 11 and 12, 2014. Three days were allotted for the data collection of the ARL. For the whole data collection in Bangkok, the Thai version of the questionnaire was used.

For the data of the BTS, questionnaires from the pilot survey were used since these data were already clear and reliable. A total of 434 reliable data were gathered which is still well above the target of 400 surveys according to the Yamane sample size computation. The BTS has many lines and stations hence it was easier to obtain a mix of different respondents.

There were 444 reliable surveys out the 500 questionnaires that were distributed. Like the BTS, the MRT traverses around several schools and CBD’s. This means that data were distributed to different people.

Lastly, out of the 500 surveys that were distributed to the ARL riders, 443 surveys were reliable. During the data collection for the ARL, several problems were happening with regards with the operations of the system. Fewer trains were used during the time due to the maintenance of the coaches. This resulted to the disappointment of the commuters since there was longer waiting time and not all services were operational. Data obtained from this data collection might not be the “real” response that respondents would give compared to if the ARL was operating normally.

3.7 Summary

In summary, price elasticity and the Kishi’s Logit PSM (KLP) are the main methods to be used in this research. With the pilot survey, the design of the questionnaire and the usage of the methods to be used were tested which led to good results. The pilot survey helped achieve better understanding on how to approach the main data collection as well as how to analyze with the given methods.

Chapter 4
Descriptive Statistics

Using statistical software the descriptive statistics were obtained. Some of the socio-economic variables in the survey were controlled by trying to proportion respondents in terms of gender, occupation, and as much as possible by age. This is to have disparity of answers given by different respondents of different gender, age group etc. Statistics are separated by country.

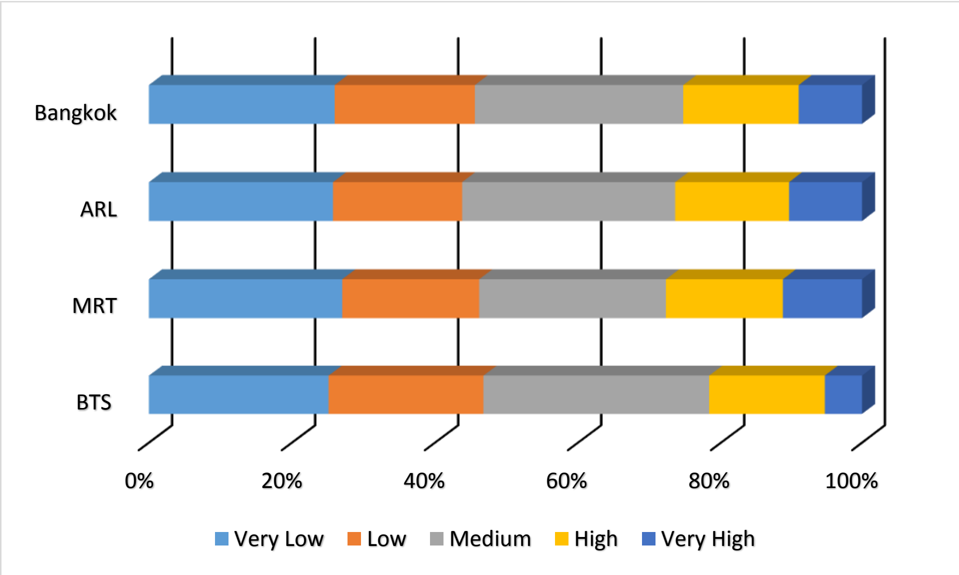
4.1 Bangkok Statistics

After data collection was completed, statistics were summarized for every rail system in both countries. Table 4.1 shows the complete summary of the socio-economic statistics for Bangkok, namely, the BTS, MRT, ARL, and all trains.

Table 4.1 Summary of Socio-economic Characteristics of Bangkok Data

Variable	Label	Percentage			
		BTS	MRT	ARL	Total
Count		**434**	**444**	**443**	**1321**
Gender	Male	43.3	48.2	49.2	46.9
	Female	56.7	51.8	50.8	53.1
Age Group	18 and Below	11.1	11.9	7.2	10.1
	19-25 years old	41.2	42.9	39.9	41.3
	26 to 35 years old	30.0	30.9	27.1	29.2
	36 to 50 years old	13.4	10.2	17.5	13.6
	Over 50	4.4	4.5	8.4	5.8
Marital Status	Single	81.8	81.1	73.6	78.8
	Married	17.3	17.1	26.0	20.1
	Others	0.9	1.8	.5	1.1
Occupation	Student	39.6	49.5	37.9	42.4
	Employee	44.7	38.1	38.4	40.3
	Business Owner	5.5	5.9	10.6	7.3
	Independent Professional	6.2	4.1	9.5	6.6
	Others	3.9	2.5	3.6	3.3

The controlled variables which are gender, age group, and occupation are shown in Table 4.1. Males and females were close to 50% each per train which obtains both opinions for different gender. As for controlling the occupation variable, almost 50% of students and workers were obtained. Having controlled variables will be good for data analysis to observe affected variables with good proportion.



Note: Monthly income levels for Bangkok follows: Very Low = < 9,000 Baht, Low = 9,000-15,000 Baht, Medium = 15,001- 30,000 Baht, High = 30,001-50,000 Baht, Very High = > 50,000 Baht.

Figure 4.1 Monthly Income Distribution Charts per Urban Rail System in Bangkok

The monthly income of Bangkok rail respondents are summarized in the charts shown in Figure 4.1. Notice that respondents who ride the Bangkok urban rail systems are almost distributed equally whether it is *Very Low* income, *Low* income, Medium income or *High* income. This shows that whatever income people in Bangkok have, they will patronize the urban rail systems. In terms of monthly income, riders that have *Medium* income represent the most riders, followed by the *Very Low* income people, then *Low* income, *High* income and lastly *Very High* income people.

Household statistics for Bangkok are summarized in Figure 4.2. As seen in the charts, respondents with 4 household members are the usual urban rail users for all three systems in Bangkok, followed by 3 household members. For household income, the BTS respondents have balanced household income users. Users of the BTS with 25,000 to 45,000 Baht and more than 100,000 Baht household income are almost equal at 21.4% and 21.7%, respectively. On the other hand, both MRT and ARL users comprises of mostly more than 100,000 income in a household.

Figure 4.2 Summary of Household Information of Bangkok Respondents

Vehicle ownership is summarized in Figure 4.3 where car ownership and motorcycle ownership were obtained for all urban rail systems in Bangkok. Car ownership data shows that urban rail users in Bangkok still use the system despite having 1 or 2 cars. The chart shows that most respondents own a car or two. On the other hand the majority of respondents do not own a motorcycle. This goes for all urban rail data.

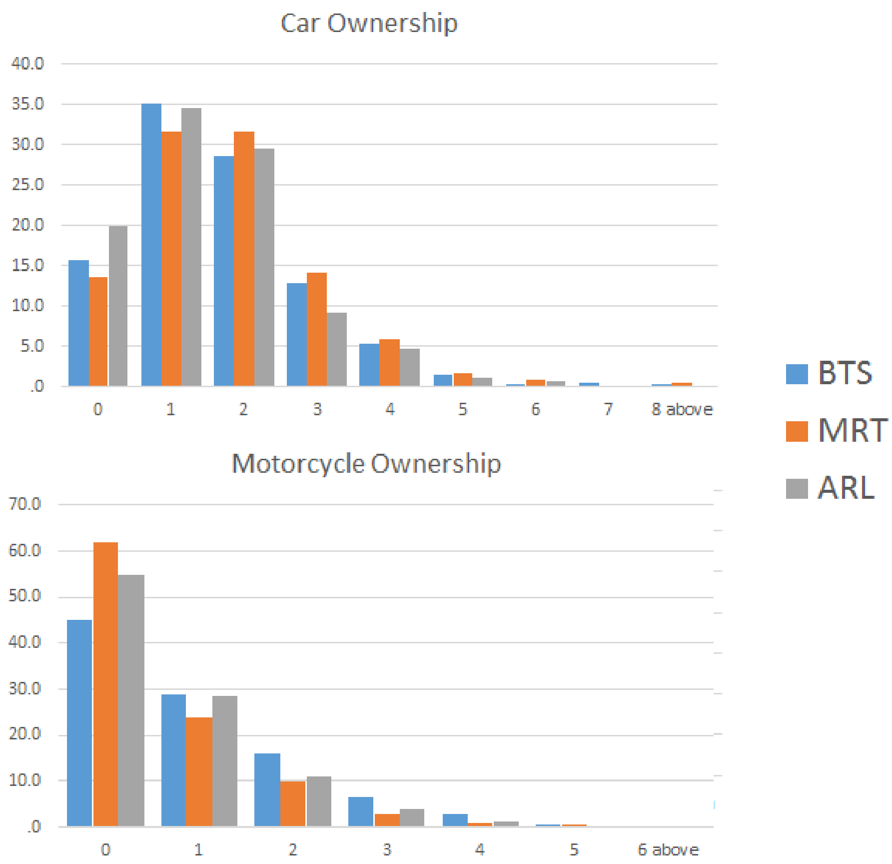


Figure 4.3 Summary of Vehicle Ownership of Bangkok Respondents

Table 4.2 Summary of Urban Rail Information in Bangkok Data Gathering

Variable	**Label**	**Percentage**			
		BTS	**MRT**	**ARL**	**Total**
Frequency of Use	often	53.5	52.5	41.3	49.1
	rarely	20.3	20	29.6	23.3
	sometimes	26.3	27.5	29.1	27.6
Purpose of Travel	Work/School	76.0	80.6	82.4	79.7
	Leisure	24.0	19.4	17.6	20.3
Connect to other transit system	Yes	28.1	36.9	59.8	41.7
	No	71.9	63.1	40.2	58.3
Satisfaction	Extremely Satisfied	5.3	10.1	6.1	7.2
	Very Satisfied	48.8	46.4	28.7	41.3
	Moderately Satisfied	43.1	41.2	51.5	45.3
	Slightly Satisfied	2.5	2.3	11.3	5.4
	Not at all Satisfied	.2	0	2.5	.9

For the urban rail information, summarized in Table 4.2, the desired respondents were urban rail frequent users, people who mainly use a single rail system, and people who use the system for work or school. The table summarizes everything where in respondents are mostly frequent users (often), most use the system for school or work, and most of them do not connect to other transit systems and only use the urban rail system.

For the satisfaction of respondents, which is also shown in Table 4.2, most respondents rate their experience with the BTS and the MRT as “Very Satisfied” and Moderately Satisfied”. This shows that their experience with these two urban rail systems are good. On the other hand, the ARL receives a “Moderately Satisfied” rating. The cause of this may be because of the current situation of the ARL where not all coaches are being used due to maintenance and safety issues.

4.2 Manila Statistics

All trains for the Manila data gathering were summarized per train and as a country. Table 4.3 summarizes all socio-economic information. The same with Bangkok data, the variables gender, age group, and occupation were controlled for a 50-50 proportion. Gender was not that equal where males were about 60%. There were mostly 19 to 25 year old respondents in the Manila data which was close to 55% of all the respondents. Lastly for the variable marital status, most of the respondents were single at almost 90% of all the respondents.

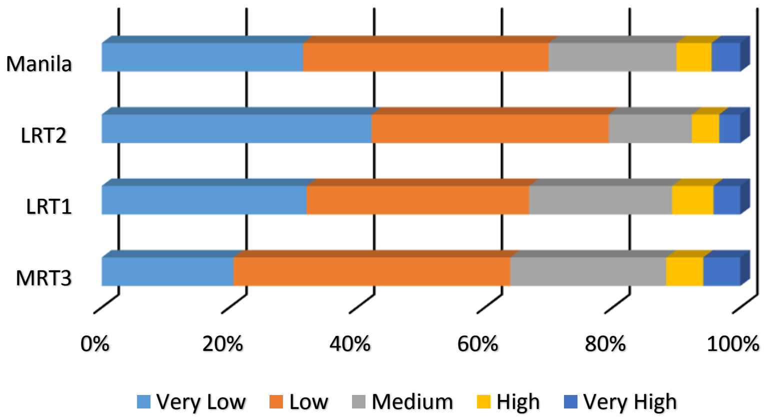
Table 4.3 Summary of Socio-economic Characteristics of Manila data

Variable	Label	Percentage			
		MRT3	LRT1	LRT2	Total
Count		499	496	483	1478
Gender	Male	60.3	57.7	56.7	58.3
	Female	39.7	42.3	43.3	41.7
Age Group	18 and Below	15.6	22.4	31.5	23.1
	19-25 years old	57.2	52.6	54.8	54.9
	26 to 35 years old	17.2	17.9	9.4	15.0
	36 to 50 years old	7.8	6.3	3.2	5.8
	Over 50	2.0	0.8	0.8	1.2

Variable	Label	Percentage			
		MRT3	LRT1	LRT2	Total
Marital Status	Single	83.2	88.1	92.3	87.8
	Married	16.2	11.5	7.5	11.8
	Others	0.6	0.4	.2	.4
Occupation	Student	45.7	54	66.0	55.1
	Employee	51.5	39.3	30.0	40.4
	Business Owner	0.8	2.2	1.2	1.4
	Independent Professional	0.2	2.4	1.7	1.4
	Others	1.8	2	1.0	1.6

Still from Table 4.3, the variable occupation in the MRT3 and the LRT1 were controlled where both are close to 50% proportion but for the LRT2 there were more students. The reason for having more student respondents in the LRT2 is because the line traverses along the University Belt of Manila, which is the line that goes through a lot of universities and colleges.

Monthly income of urban rail users in Manila are summarized in pie charts for the MRT3, LRT1, LRT2 and all trains as seen in Figure 4.4. It can be seen with all urban rail systems in Manila, most of the users have *Very Low, Low*, to *Medium* income. People with *High* or *Very High* income rarely use the urban rail systems in Manila according to the data with only 6% and 4% of the total respondents, respectively.



Note: Monthly income levels in Manila follows: Very Low = < 5,000 Pesos, Low = 5,000-15,000 Pesos, Medium = 15,001-25,000 Pesos, High = 25,001-40,000 Pesos, Very High = > 40,000 Pesos.

Figure 4.4 Monthly Income Distribution Charts per Urban Rail System in Manila

Household information of the respondents in Manila are summarized in Figure 4.5. Most respondents in Manila have 5 household members in the data of the MRT3 and the LRT2 with 4 household members coming in next. LRT1 respondents have mostly 4 household members. An interesting result is that the majority of respondents have “More than 100,000 Pesos” of household income. Comparing with the monthly income of the rail users seen in Figure 4.4, most users have Low to Very low monthly income in all trains but most of them have high household income of more than 100,000 Pesos.

Figure 4.5 Summary of Household Information of Manila Respondents

Figure 4.6 summarizes vehicle ownership of respondents in Manila. In all urban rail systems in Manila, a big percentage of the respondents do not own a car at all. As seen in the Figure, 45% of the LRT2 respondents do not own a car. In the MRT3 and LRT1 data respondents with no car also have a big percentage at 37% and 32% respectively. Even though respondents with cars are still a majority, the respondents with no cars come close. As for the motorcycle ownership, majority are non-motorcycle owners at 82.8%, 81.0%, and 74.1% for the MRT3, LRT1, and LRT2, respectively. Motorcycle owners would rather ride their own motorcycle rather than using the urban rail systems.

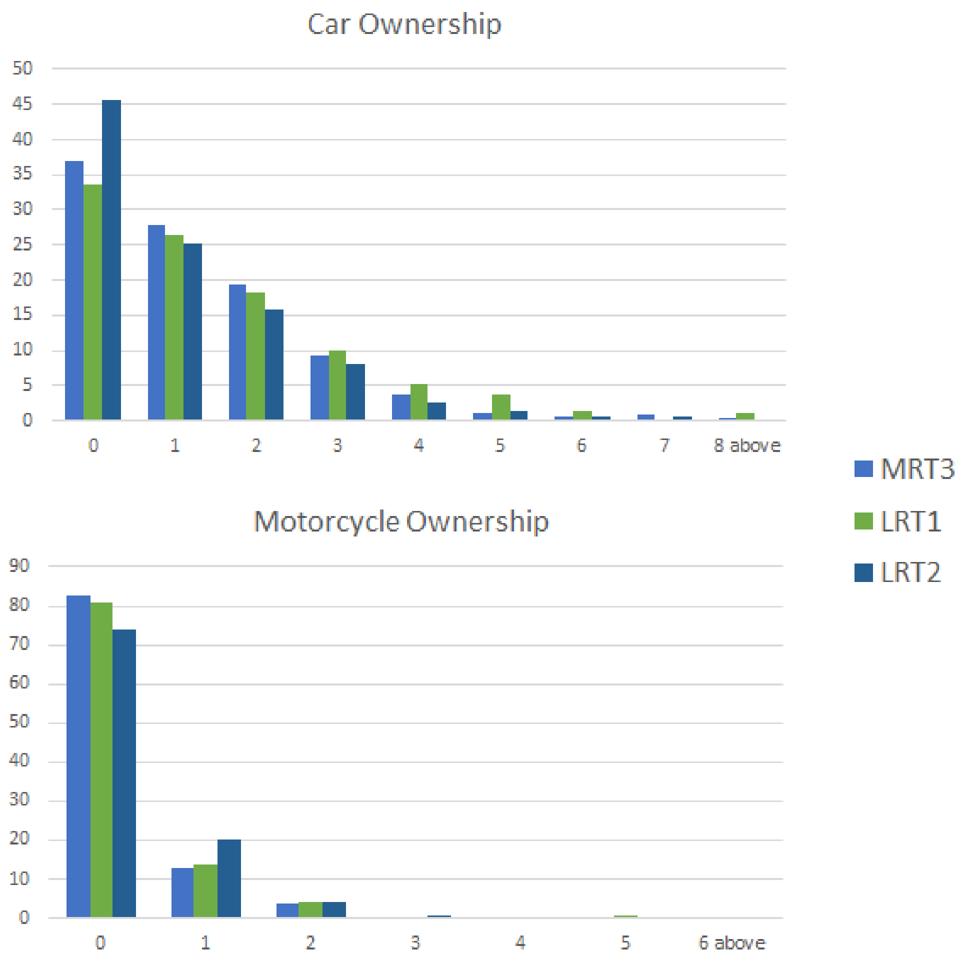


Figure 4.6 Summary of Vehicle Ownership of Manila Respondents

For the urban rail information of the Manila respondents, frequency of use, purpose of travel, connection to other transit system, and satisfaction of the urban rail system are summarized in Table 4.4. Again, frequent users are targeted and for the MRT3 there are 46.9%, 65.9% for the LRT1 respondents, and 72.7% for the LRT2 respondents.

Also, people who use the urban rail system for work or school are desired wherein a big percentage on all trains are school and work goers. Majority of MRT3 users connect to other transit systems available (59.9%), while for the LRT1 and LRT2 majority do not connect to other transit system anymore at 53.2% and 61.5%, respectively.

Table 4.4 Summary of Urban Rail Information in Bangkok Data Gathering

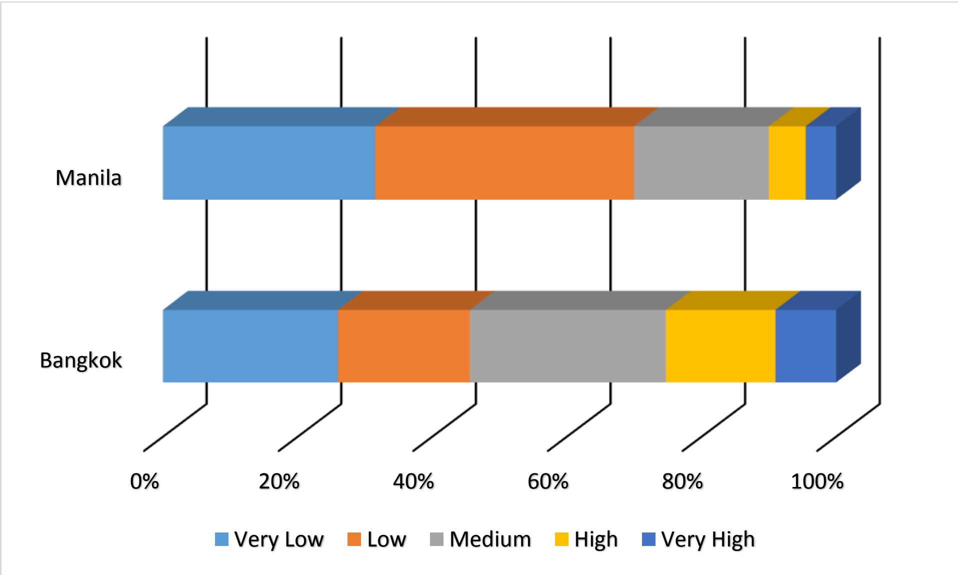
Variable	Label	Percentage			
		MRT3	LRT1	LRT2	All trains
Frequency of Use	often	46.9	65.9	72.7	61.7
	rarely	10.2	7.1	6.6	8.0
	sometimes	42.9	27.0	20.7	30.3
Purpose of Travel	Work/School	63.1	80.2	78.3	73.8
	Leisure	36.9	19.8	21.7	26.2
Connect to other transit system	Yes	59.9	46.8	38.5	48.5
	No	40.1	53.2	61.5	51.5
Satisfaction	Extremely Satisfied	1	2.2	6.6	3.2
	Very Satisfied	2.6	9.5	32.3	14.6
	Moderately Satisfied	31.7	42.3	47.4	40.4
	Slightly Satisfied	41.5	30.8	9.9	27.6
	Not at all Satisfied	23.2	15.1	3.7	14.1

For the respondent's satisfaction on Manila urban rail systems, it is summarized at the last part of Table 4.4. Extremely satisfied users are rare where only 1, 2.2, and 6.6 percent of all respondents agree for the MRT3, LRT1, and the LRT2, respectively. Note that the LRT2 is the newest rail system in Metro Manila, hence, having the highest rating compared to the other two. Majority of respondents for the MRT3 say that they are only slightly satisfied at 41.5% and a large proportion also comes from users being only moderately satisfied or not satisfied at all. A similar situation is seen with LRT1 respondents where majority are moderately satisfied with the system. Lastly, the LRT2 respondents feel that they are moderately satisfied with the system wherein a big proportion are also very satisfied with the system at 32.3%.

4.3 Comparison of Bangkok and Manila Statistics

One objective of this research paper is to compare the travel behavior, characteristics of urban rail users, and quality of urban rail systems of Bangkok and

Manila. One way is by comparing both country's descriptive statistics from socio-economic characteristics as well as urban rail information of the respondents. After further study of the descriptive statistics, only the interesting variables are to be compared (e.g. monthly income, vehicle ownership and rail satisfaction).



Note: Monthly income levels for Bangkok follows: Very Low = < 9,000 Baht, Low = 9,000-15,000 Baht, Medium = 15,001- 30,000 Baht, High = 30,001-50,000 Baht, Very High = > 50,000 Baht; while Manila follows: Very Low = < 5,000 Pesos, Low = 5,000-15,000 Pesos, Medium = 15,001-25,000 Pesos, High = 25,001-40,000 Pesos, Very High = > 40,000 Pesos.

Figure 4.7 Comparison of Monthly Income of Bangkok and Manila Respondents

A comparison of monthly income from both study areas are shown in Figure 4.7. In Bangkok, people who ride the urban rail systems have distributed proportions whether they have *Very Low, Low, Medium, High,* or *Very High* income. No matter what monthly income Bangkok rail users have, there will be rail users from different levels. As for the Manila data, rarely are *High* income earners or *Very High* income earners riding the rail systems. Most are income earners that are *Very Low*, *Low*, or *Medium*. *High* and *Very High* income earners would rather ride different transport systems in Manila.

Figure 4.8 shows the vehicle ownership comparison on both Bangkok and Manila's respondents. Bangkok's car ownership in the given data shows majority of users have cars compared to users without a car. Despite having a car, users still choose to ride the urban rail in Bangkok. On the other hand, Manila rail users have a large proportion of users without cars. This shows that Manila rail users are most likely to take public transportation since a lot are non-car owners. For motorcycle ridership, similar findings are shown. Both Bangkok and Manila rail users do not own motorcycles.

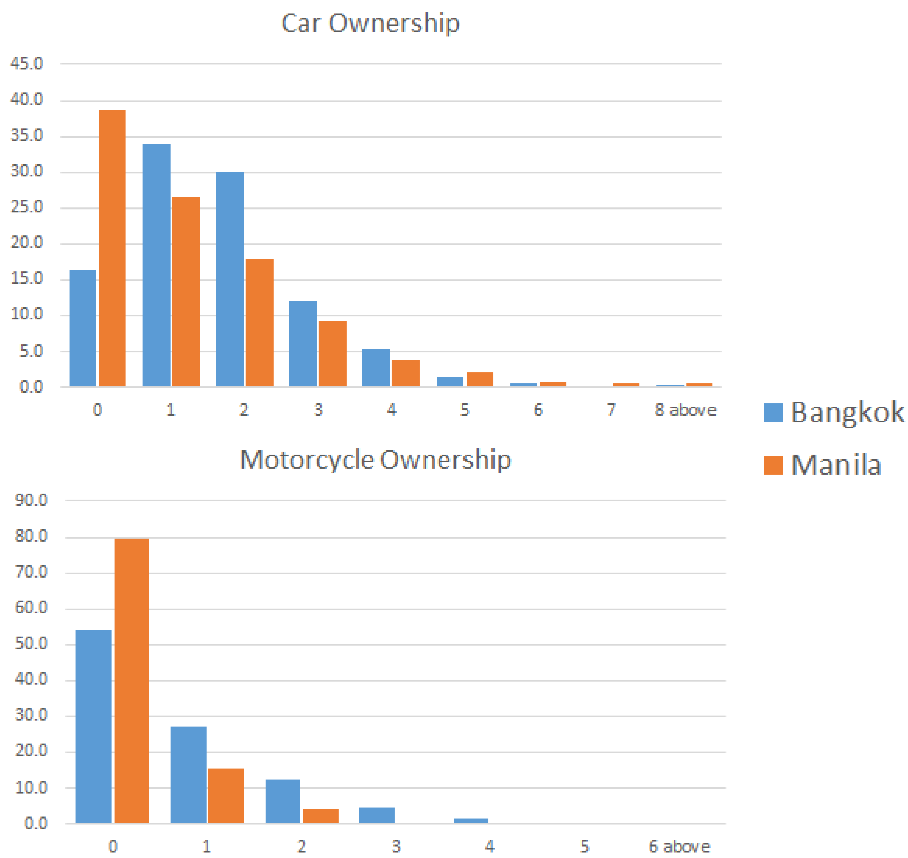


Figure 4.8 Comparison of Vehicle Ownership of Bangkok and Manila Respondents

Urban rail satisfaction were asked for every urban rail system in both Bangkok and Manila. Respondents were asked how they feel about the current situation of the urban rail system. Figure 4.9 summarizes the answers and is compared by study area. It can be seen that Bangkok satisfaction rates are heavier towards the left part of the graph where satisfaction rates are better. Manila's on the other hand are heavier towards the right side of the graph where lower satisfaction rates are. Bangkok rail users are mostly moderately satisfied and very satisfied with the given urban rail system in the city, while Manila rail users are mostly moderately satisfied and slightly satisfied. Extremely satisfied users are rare for both Manila and Bangkok respondents but there are still more users who are extremely satisfied for the Bangkok rail compared to Manila rail. In contrary, there are more users who are not satisfied at all in Manila where Bangkok users do not rate their rails as such.

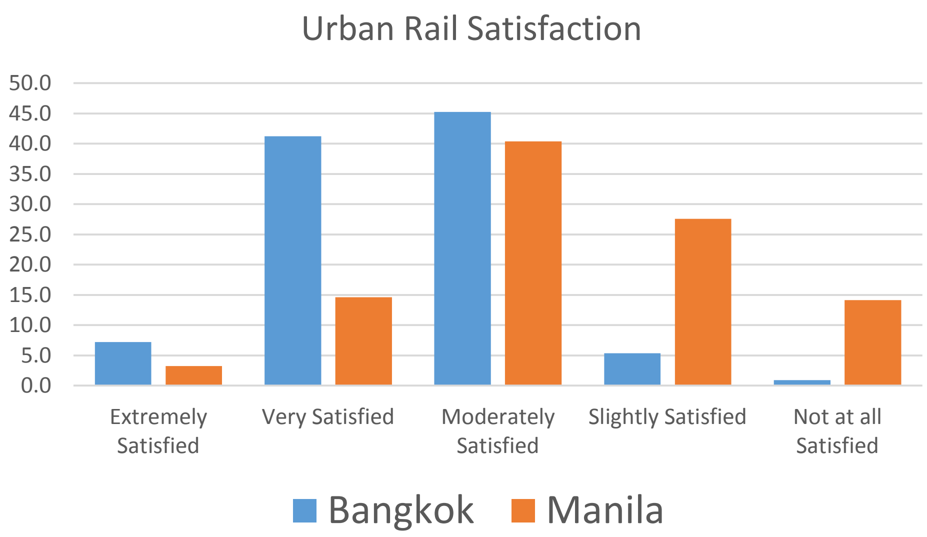


Figure 4.9 Comparison of Urban Rail Satisfaction of Bangkok and Manila Respondents

4.4 Summary

According to the descriptive statistics gathered in this research, both Bangkok and Manila urban rail passengers have their similarities as well as differences. The most important differences to consider are: (1) Income shows that any income earner in Bangkok are possible users while Manila users are mostly very low to medium income earners only. (2) Car ownership also shows that Bangkok users still ride the urban rail systems despite having a large proportion of users owning cars, on the other hand, Manila users have the largest proportion of having no cars at all. (3) Lastly, most Bangkok rail users are very satisfied with their experience with Bangkok rails, in contrary, Manila rail users are less satisfied. This indicates that urban rail quality in Bangkok is better than Manila.

Chapter 5
Results and Discussions

5.1 Kishi's Logit PSM (KLP)

In order to use the KLP, common transit fare prices are needed to estimate the results. The survey questionnaire asks a question on what ticket price is being paid by the passenger for their usual route in the urban rail system. To further filter common ticket prices, only single journey tickets and stored value ticket holders were considered in the analysis of the KLP. The single journey tickets and the stored value ticket prices only differ by 1.00 Baht in the Bangkok Rails while there is no difference in Manila Rails. From the descriptive statistics, the most common transit fare price considered were a representation of low priced fares (usually short distance travels) and the more expensive fare prices. KLP analysis was done for every urban rail in both Bangkok and Manila. KLP was also done by the income level, comparing the low income rail users with the high income rail users.

5.1.1 KLP analysis of Bangkok Urban Rail Systems

To analyze Bangkok urban rail systems with KLP a lower and an upper fare was considered to see price preferences from upper bound fares and lower bound fares. Bangkok urban rail transit fares ranges from 15.00 Baht to 52.00 Baht; hence, prices at 15.00 Baht to 30.00 Baht were considered the lower bound fares and 31.00 Baht and above were considered as the upper bound fares. Different fare prices were considered in every urban rail in Bangkok depending on the most bought ticket by respondents. After which, KLP analysis was also done by the income level to see how different the users feel considering their income levels.

5.1.1.1 BTS Sky-Train

Lower Fare Analysis

Out of the 434 questionnaire survey counts for the BTS, 83 users were paying 25.00 Baht to use the BTS. The analysis of the KLP was done with the 83 users who pay 25.00 Baht. From the four prices of PSM, logit models of relative cumulative frequency were derived as shown in equations 1 to 5.

$$T = \frac{1}{1 + \exp F(x)} \quad (1)$$

T_1; Should be less expensive $= -0.345x + 9.364 \ (R^2 = 0.97)$ (2)

T_2; Should be more expensive $= 0.236x - 7.463 \ (R^2 = 0.93)$ (3)

T_3; Too expensive to be WTP $= -0.154x + 6.246 \ (R^2 = 0.92)$ (4)

T_4; Too cheap to be WTP $= 0.437x - 9.300 \ (R^2 = 0.96)$ (5)

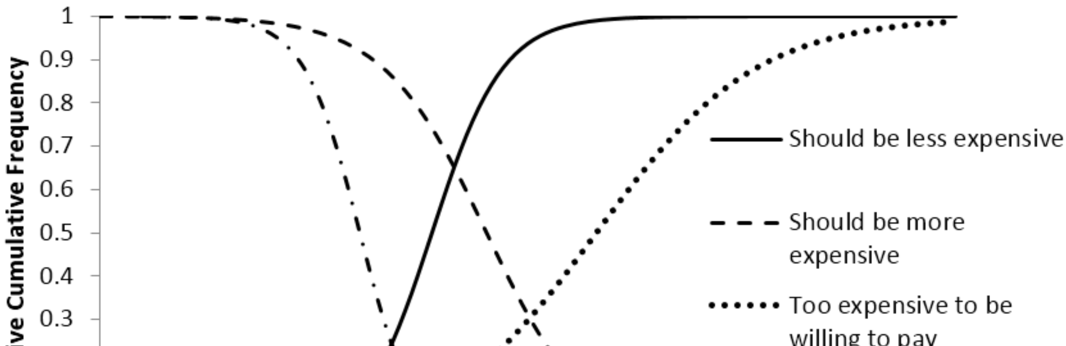


Figure 5.1 Price Indicator for a 25 Baht Ticket Price for the BTS

The relative cumulative frequency of the four prices are graphed versus the transit fare price as shown in Figure 5.1. The graph represents the transit fare price indicators from the KLP. The minimum price obtained from the graph is 24.00 Baht where the line “Should be less expensive” and “too cheap to be willing to pay” intersects. The standard price is 29.00 Baht from the intersection of “Should be less expensive” and “Should be more expensive”. From the intersection of “Too expensive to be willing to pay” and “Too cheap to be willing to pay” the reasonable price is 26.00 Baht. Lastly, the maximum price obtained from the intersection of “Too expensive to be willing to pay” and “Should be more expensive” is 35.00 Baht. The sensible price range for the transit fare is from 24.00 Baht to 29.00 Baht while the acceptable price is from 24.00 Baht to 35.00 Baht. The urban rail users feel that at this price range, they will still patronize the BTS. Table 5.1 summarizes the price results from the KLP analysis for a 25.00 Baht ticket price of the BTS.

Table 5.1 KLP Price Results for a 25 Baht Ticket Price for the BTS

Minimum Price	24.00 Baht
Standard Price	29.00 Baht
Reasonable Price	26.00 Baht
Maximum Price	35.00 Baht
Sense of Reasonability	24.00 to 29.00 Baht
Acceptable Price Range	24.00 to 35.00 Baht

It can be seen, that the 25.00 Baht ticket price is inside the accepted range of the KLP analysis. This means that people feel that 25.00 Baht is already reasonable for the BTS rail users since it is inside the sense of reasonability range also. If ever transit fares are increased in the future, the maximum that users can pay is up to 35.00 Baht. On the other hand, when a price decrease is implemented, the lowest price that they are willing to pay is at 24.00 baht given the current quality of the BTS. A price lower than 24.00 baht will give BTS users doubts about the quality of the train.

By analyzing the KLP by the income of the users, it can be seen, as shown in Table 5.2, that Low income users have a minimum price of 23.00 baht compared to the high income users who would rather pay a minimum of 24.00 Baht. Maximum price also shows the difference between the lower income users and the high income users, wherein the high income users can pay as much as 36.00 Baht to compared to 35.00 Baht for the low income users.

Table 5.2 KLP Price Results by Income for 25 Baht Ticket Price for the BTS

	Low Income Users	**High Income Users**
Minimum Price	23.00 Baht	24.00 Baht
Standard Price	28.00 Baht	29.00 Baht
Reasonable Price	26.00 Baht	25.00 Baht
Maximum Price	35.00 Baht	36.00 Baht
Sense of Reasonability	23.00 to 28.00 Baht	24.00 to 29.00 Baht
Acceptable Price Range	23.00 to 35.00 Baht	24.00 to 35.00 Baht

Upper Fare Analysis

Out of the 434 respondents, 98 of them pay for a 42.00 Baht ticket for their usual route which was eventually used for the analysis using the KLP. Using the logit models in equations 6 to 10, the relative cumulative frequency was graphed as shown in Figure 5.2.

$$T = \frac{1}{1 + \exp F(x)} \tag{6}$$

T_1; Should be less expensive $= -0.203x + 7.959 \ (R^2 = 0.93)$ (7)

T_2; Should be more expensive $= 0.147x - 6.600 \ (R^2 = 0.80)$ (8)

T_3; Too expensive to be WTP $= -0.129x + 6.785 \ (R^2 = 0.85)$ (9)

T_4; Too cheap to be WTP $= 0.172x - 5.118 \ (R^2 = 0.92)$ (10)

From the intersections of the relative cumulative frequencies of the four prices, the estimated price settings were obtained. The minimum price that can be established is 35.00 Baht, the reasonable price is 40.00 Baht, the standard price is 42.00 Baht, and the maximum price is 49.00 Baht. According to the price indicator, users will patronize the BTS if the transit fares are within the acceptable ranges. Sense of reasonability is from 35.00 Baht to 42.00 Baht, while the acceptable price range is from 35.00 Baht to 49.00 Baht.

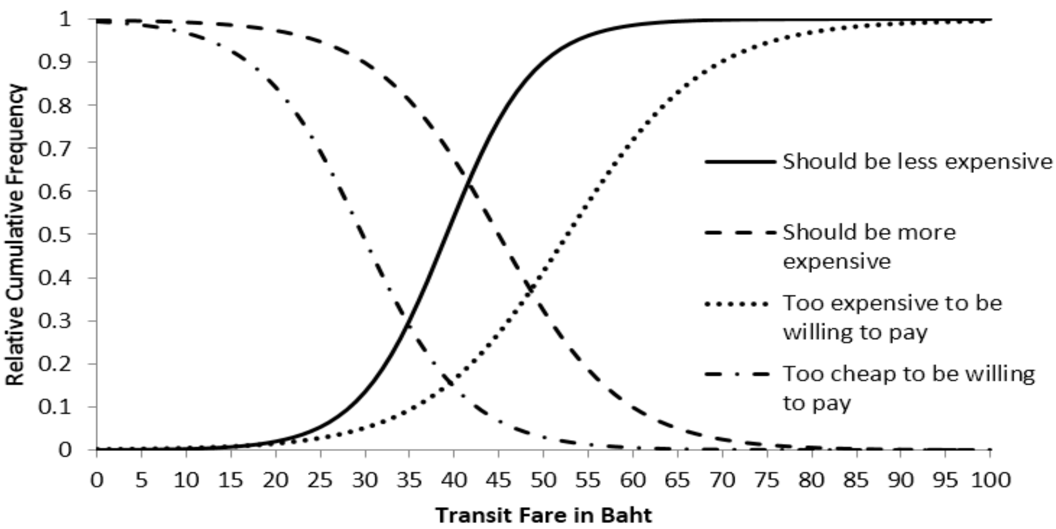


Figure 5.2 Price Indicator for a 42 Baht Ticket Price for the BTS

The 42.00 Baht BTS ticket price is inside the range of what respondents are willing to pay which is from 35.00 Baht to 49.00 Baht even though they feel that the reasonable price should be 40.00 Baht only. The standard price, wherein at this price range the quality and the price is well balanced, is the same as the current ticket price, 42.00 Baht. This means that at 42.00 Baht, is already priced good given the quality of the BTS system. A price increase in the future could be up to 49.00 Baht where users would still ride the BTS while a price decrease can go down up to 35.00 Baht. Summary of the prices indicated by the KLP is shown in Table 5.3.

Table 5.3 KLP Price Results for a 42 Baht Ticket Price for the BTS

Minimum Price	35.00 Baht
Standard Price	42.00 Baht
Reasonable Price	40.00 Baht
Maximum Price	49.00 Baht
Sense of Reasonability	35.00 to 42.00 Baht
Acceptable Price Range	35.00 to 49.00 Baht

Different results can be observed between the lower and the upper fare prices. The lower fare price results showed that the reasonable price for the current 25 Baht ticket can be worth more at 26.00 Baht up to a maximum of 35.00 Baht, but should not be less than 24.00 Baht. For the upper fare price, a reasonable price should be 40.00 Baht, which was 2.00 Baht lower than the current fare. This result signified that the lower fare price can increase more while the upper fare price should be lessened to meet the reasonable prices. Nevertheless, both ticket classes were still in the range of what respondents were willing to pay as well as the sense of reasonability range.

Table 5.4 KLP Price Results by Income for 42 Baht Ticket Price for the BTS

	Low Income Users	High Income Users
Minimum Price	34.00 Baht	35.00 Baht
Standard Price	41.00 Baht	42.00 Baht
Reasonable Price	39.00 Baht	40.00 Baht
Maximum Price	44.00 Baht	50.00 Baht
Sense of Reasonability	34.00 to 41.00 Baht	35.00 to 42.00 Baht
Acceptable Price Range	34.00 to 44.00 Baht	35.00 to 50.00 Baht

Analyzing income by KLP for the 42 Baht ticket for the BTS, shown in Table 5.4, shows a difference. Low income users would pay a minimum of 34.00 Baht up to 44.00 Baht only compared to the higher income users where they can pay a higher minimum price of 35.00 Baht and a 50.00 Baht maximum price.

5.1.1.2 Mass Rapid Transit (MRT)

For the Mass Rapid Transit in Bangkok, the lower fare considered was the 24 and 26 Baht tickets while the upper fare considered was the 40 Baht ticket price. 24 and 26 Baht tickets were combined since they show similar results in the KLP analysis.

Lower Fare Analysis

Out of the 444 total respondents for the MRT, 89 were paying for the 24 or 26 Baht tickets, which is the most ticket bought for the MRT. Again, the four prices of PSM were analyzed by using the Kishi Logit Model, and resulted to equations 11 to 14.

T_1; Should be less expensive $= -0.582x + 14.056 \ (R^2 = 0.94)$ (11)

T_2; Should be more expensive $= 0.261x - 7.991 \ (R^2 = 0.96)$ (12)

T_3; Too expensive to be WTP $= -0.151x + 5.887 \ (R^2 = 0.89)$ (13)

T_4; Too cheap to be WTP $= 0.363x - 7.521 \ (R^2 = 0.94)$ (14)

Given these equations, the price indicator for the KLP was graphed versus the ticket price shown in Figure 5.3. Data was analyzed as 25 Baht tickets. After the KLP analysis it was found that the minimum price for a 25 Baht ticket price for the MRT is at 23 Baht, reasonable price and standard price are the same at 26 Baht, and the maximum price is 34 Baht. The reason that standard price and reasonable price is the same is because the line of “Should be Less Expensive” (Also known as Reasonable price before converting to the complementary event), contains few variations of answers from the survey which results to a steeper line as shown in the graph.

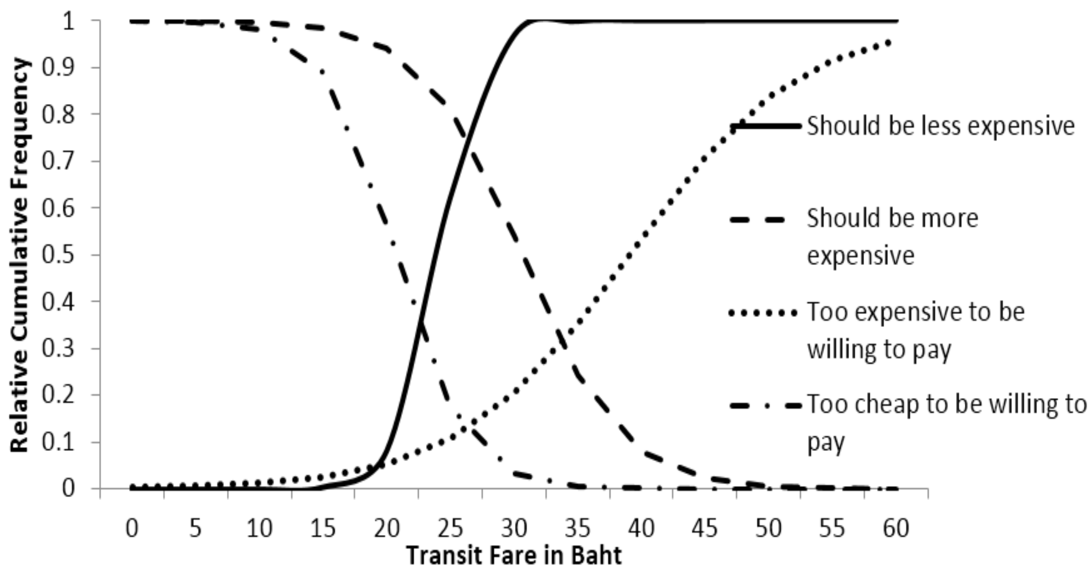


Figure 5.3 Price Indicator for a 25 Baht Ticket Price for the MRT

KLP price results are summarized in Table 5.5. Given the results, the acceptable price range for a 25 Baht ticket for the MRT is from 23 Baht to 34 Baht and the sense of reasonability is from the minimum to the standard price. A 25 Baht ticket for the MRT is already accepted by MRT respondents since it is inside the acceptable range. It is also inside the range of sense of reasonability.

KLP price results by income are summarized in Table 5.6. For the MRT in Bangkok, the income level is not a factor for the users since it shows almost the same KLP results for both low and high income users.

Table 5.5 KLP Price Results for a 25 Baht Ticket Price for the MRT

Minimum Price	23.00 Baht
Standard Price	26.00 Baht
Reasonable Price	26.00 Baht
Maximum Price	34.00 Baht
Sense of Reasonability	23.00 to 26.00 Baht
Acceptable Price Range	23.00 to 34.00 Baht

Table 5.6 KLP Price Results by Income for 25 Baht Ticket Price for the MRT

	Low Income Users	**High Income Users**
Minimum Price	23.00 Baht	23.00 Baht
Standard Price	26.00 Baht	26.00 Baht
Reasonable Price	27.00 Baht	25.00 Baht
Maximum Price	33.00 Baht	34.00 Baht
Sense of Reasonability	23.00 to 26.00 Baht	23.00 to 26.00 Baht
Acceptable Price Range	23.00 to 33.00 Baht	23.00 to 34.00 Baht

Upper Fare Analysis

85 respondents for the MRT buys a 40 Baht ticket and this data was analyzed as the upper fare analysis for the MRT. Equations 15 to 18 shows the results of the logit model for every price sensitivity measurement.

T_1; Should be less expensive $= -0.272x + 10.357 \ (R^2 = 0.73)$ (15)

T_2; Should be more expensive $= 0.232x - 9.404 \ (R^2 = 0.98)$ (16)

T_3; Too expensive to be WTP $= -0.167x + 8.376 \ (R^2 = 0.92)$ (17)

T_4; Too cheap to be WTP $= 0.178x - 5.123 \ (R^2 = 0.94)$ (18)

Figure 5.4 shows the KLP price indicator for a 40 Baht ticket in the MRT while Table 5.7 summarizes the KLP analysis prices. Minimum price and the maximum price is from 34 Baht to 44 Baht which is also the acceptable price range. Sense of reasonability price range is from 34 Baht to 39 Baht. A 40 Baht ticket price in the MRT of Bangkok is inside the acceptable range of ticket prices with the KLP analysis although it is not inside the range of the sense of reasonability.

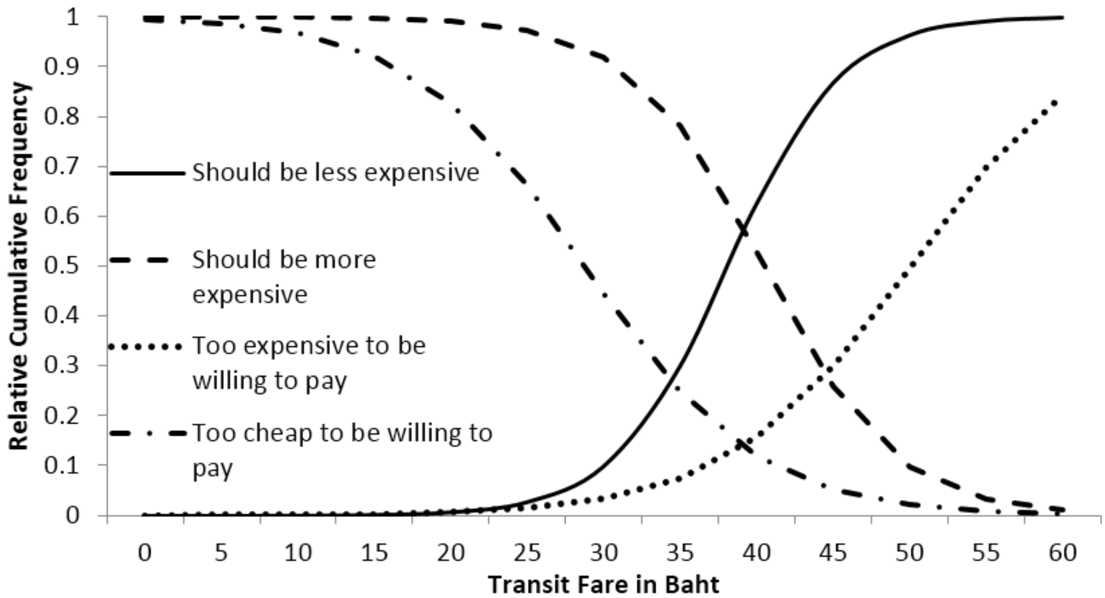


Figure 5.4 Price Indicator for a 40 Baht Ticket Price for the MRT

Table 5.7 KLP Price Results for a 40 Baht Ticket Price for the MRT

Minimum Price	34.00 Baht
Standard Price	39.00 Baht
Reasonable Price	39.00 Baht
Maximum Price	44.00 Baht
Sense of Reasonability	34.00 to 39.00 Baht
Acceptable Price Range	34.00 to 44.00 Baht

In contrast with the 25 Baht ticket KLP analysis by income for the MRT, the 40 Baht KLP analysis by income for MRT shows a difference wherein low income users would pay lower compared to the high income users. Results are summarized as seen in Table 5.8.

Table 5.8 KLP Price Results by Income for 40 Baht Ticket Price for the MRT

	Low Income Users	**High Income Users**
Minimum Price	34.00 Baht	36.00 Baht
Standard Price	40.00 Baht	39.00 Baht
Reasonable Price	39.00 Baht	39.00 Baht
Maximum Price	44.00 Baht	45.00 Baht
Sense of Reasonability	34.00 to 40.00 Baht	36.00 to 39.00 Baht
Acceptable Price Range	34.00 to 44.00 Baht	36.00 to 45.00 Baht

5.1.1.3 Airport Rail Link (ARL)

KLP analysis was done for all ticket prices of the ARL and results show unusual prices for upper and lower cases. With this, the price at 30 Baht was considered for the ARL since this ticket price had the most sensible KLP result. It should also be noted that data gathering for the ARL was difficult for the research team since surveys were not done face to face but rather by distributing survey forms inside the moving trains. This resulted to the confusion of the respondents when left alone to answer especially with the PSM questions which was for the KLP analysis. Specifically, prices asked for “expensive” and “too expensive to be willing to buy” were mostly interchanged which resulted to inaccurate data. Also, the ARL was not in normal operation during data gathering due to maintenance problems which may cause some answers to be biased.

Out of the 443 respondents, 79 who paid 30 Baht for the ARL were analyzed and the logit equations are shown in equations 19 to 22 and were then graphed in Figure 5.5 by the relative cumulative frequency versus the ticket price to obtain the KLP price indicator.

$T_1;$ Should be less expensive $= -0.559x + 15.978 \;\; (R^2 = 0.83)$ (19)

$T_2;$ Should be more expensive $= 0.188x - 6.473 \;\; (R^2 = 0.98)$ (20)

$T_3;$ Too expensive to be WTP $= -0.132x + 5.825 \;\; (R^2 = 0.86)$ (21)

$T_4;$ Too cheap to be WTP $= 0.299x - 7.404 \;\; (R^2 = 0.94)$ (22)

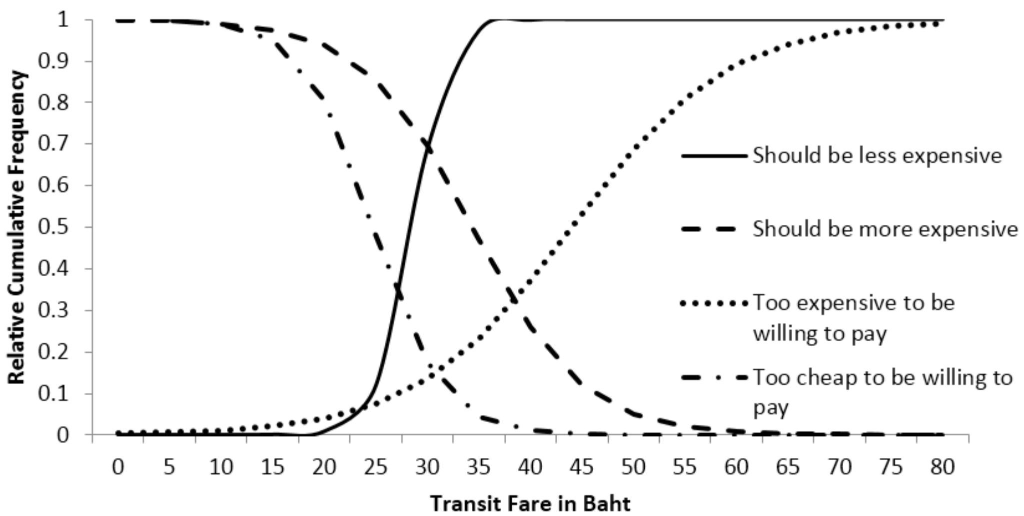


Figure 5.5 Price Indicator for a 30 Baht Ticket Price for the ARL

For a 30 Baht ticket in the ARL, based on the KLP analysis, ARL users feel that the minimum price can be 27 Baht and maximum is up to 38 Baht. The sense of reasonability range is from 27 Baht to 31 Baht only. This means that for a price of 30 Baht for the ARL, it is already inside the acceptable range and it is also inside the reasonable range.

Table 5.9 KLP Price Results for a 30 Baht Ticket Price for the ARL

Minimum Price	27.00 Baht
Standard Price	31.00 Baht
Reasonable Price	30.00 Baht
Maximum Price	38.00 Baht
Sense of Reasonability	27.00 to 30.00 Baht
Acceptable Price Range	27.00 to 38.00 Baht

Table 5.10 shows the KLP price results by income for the ARL. It can be seen that there is a huge difference with the preferences of low income users with the high income users. Low income users can pay from 27.00 to 34.00 while high income users can pay from 35.00 to 40.00 Baht.

Table 5.10 KLP Price Results by Income for 30 Baht Ticket Price for the ARL

	Low Income Users	**High Income Users**
Minimum Price	27.00 Baht	35.00 Baht
Standard Price	30.00 Baht	39.00 Baht
Reasonable Price	29.00 Baht	35.00 Baht
Maximum Price	34.00 Baht	40.00 Baht
Sense of Reasonability	27.00 to 30.00 Baht	35.00 to 39.00 Baht
Acceptable Price Range	27.00 to 34.00 Baht	35.00 to 40.00 Baht

5.1.2 KLP analysis of Manila Urban Rail Systems

To analyze the KLP in Manila urban rail systems, lower fares and upper fares are again separated to see preferences from different price ranges as well as the income levels to see the difference in preference of both low income and high income users. Since Manila rails have ticket prices which are very close to each other (From 10 Pesos to 20 Pesos only depending on the train), lower and upper fares were separated in groups.

5.1.2.1 Metro Rail Transit Line 3 (MRT3)

All prices of the MRT3 were analyzed with the KLP (MRT3 prices are 10, 11, 12, 14 and 15 Pesos only). After further analysis, it was seen that 10, 11, and 12 Peso tickets have similar results while 14 and 15 Peso tickets are also similar to each other. Lower Fare analysis were done for 10 to 12 Peso tickets and upper fare analysis were done for the 14 and 15 Peso tickets combined.

Lower Fare Analysis

The MRT3 had a total of 499 respondents after data gathering in Manila and 276 of the respondents were lower fare ticket buyers. Equations 23 to 26 represents the logit model for every PSM question.

T_1; Should be less expensive $= -0.451x + 6.943 \ (R^2 = 0.76)$ (23)

T_2; Should be more expensive $= 0.175x - 4.094 \ (R^2 = 0.82)$ (24)

T_3; Too expensive to be WTP $= -0.156x + 4.247 \ (R^2 = 0.88)$ (25)

T_4; Too cheap to be WTP $= 0.843x - 10.319 \ (R^2 = 0.94)$ (26)

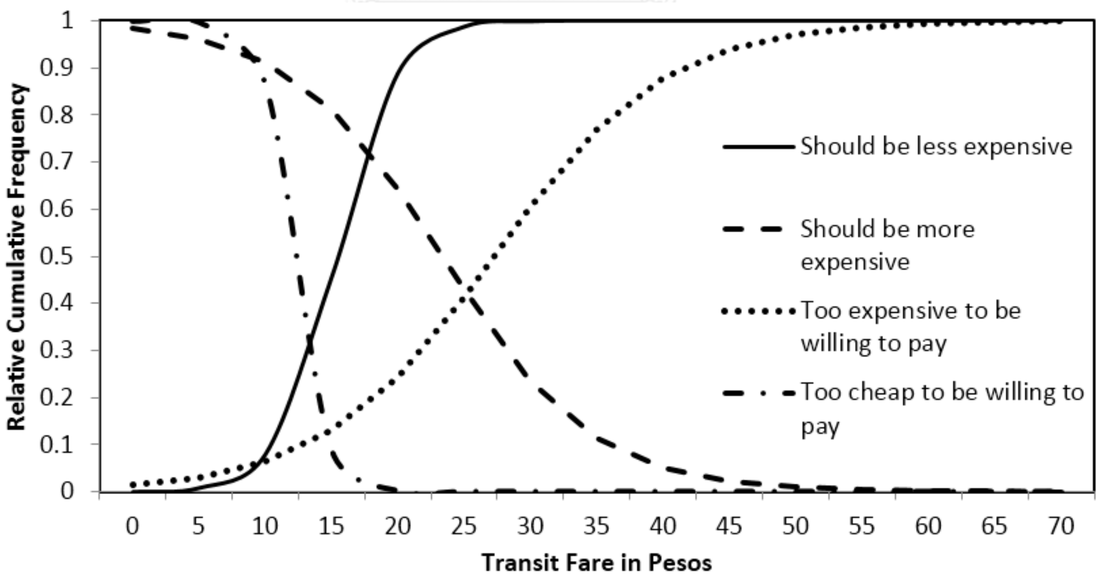


Figure 5.6 Price Indicator for a 10 to 12 Pesos Ticket Price for the MRT3

The price indicator is created given the equations formed. With the intersections of the lines for every PSM price as seen in Figure 5.6, price results were obtained as summarized in Table 5.11. For a 10 to 12 Peso ticket price in the MRT, it is seen that the minimum price that respondents are willing to pay is at 13 Pesos up to a maximum of 25 Pesos. This shows that people buying a 10 to 12 Peso ticket would be willing to pay for more since the ticket prices are not inside the acceptable range of 13 to 25 Pesos.

Table 5.11 KLP Price Results for a 10 to 12 Pesos Ticket Price for the MRT3

Minimum Price	13.00 Pesos
Standard Price	18.00 Pesos
Reasonable Price	15.00 Pesos
Maximum Price	25.00 Pesos
Sense of Reasonability	13.00 to 18.00 Pesos
Acceptable Price Range	13.00 to 25.00 Pesos

Analysis of KLP by income for the MRT3 shows a difference between low income users and high income users as seen in table 5.12. Minimum price shows no difference as both low and high income users can pay a minimum of 13.00 Pesos, on the other hand, high income users can pay as much as 25.00 Pesos to only 22.00 Pesos of the low income users.

Table 5.12 KLP Price Results by Income for 10 to 12 Pesos Ticket Price for the MRT3

	Low Income Users	**High Income Users**
Minimum Price	13.00 Pesos	13.00 Pesos
Standard Price	17.00 Pesos	17.00 Pesos
Reasonable Price	13.00 Pesos	15.00 Pesos
Maximum Price	22.00 Pesos	25.00 Pesos
Sense of Reasonability	13.00 to 17.00 Pesos	13.00 to 17.00 Pesos
Acceptable Price Range	13.00 to 22.00 Pesos	13.00 to 25.00 Pesos

Upper Fare Analysis

223 respondents from the MRT3 are upper fare ticket buyers. 14 and 15 Peso ticket data are used to analyze with the KLP. Equations 27 to 30 shows the results of PSM prices given the logit model of KLP.

T_1; Should be less expensive $= -0.748x + 12.393 \;\; (R^2 = 0.95)$ (27)

T_2; Should be more expensive $= 0.120x - 2.977 \;\; (R^2 = 0.72)$ (28)

T_3; Too expensive to be WTP $= -0.104x + 3.201 \;\; (R^2 = 0.85)$ (29)

T_4; Too cheap to be WTP $= 0.489x - 7.487 \;\; (R^2 = 0.89)$ (30)

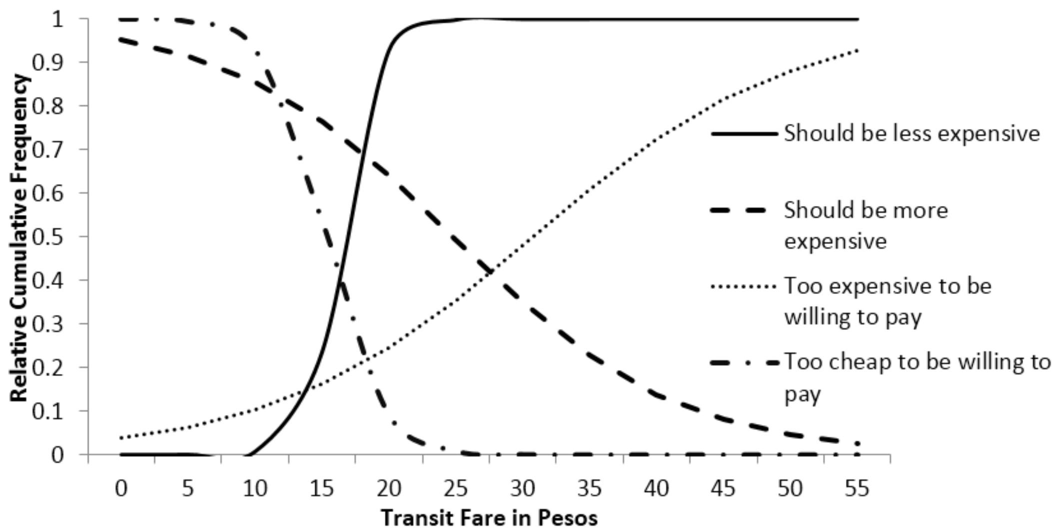


Figure 5.7 Price Indicator for a 14 and 15 Pesos Ticket Price for the MRT3

Price indicator of the 14 and 15 Peso ticket prices are created given the logit models as shown in Figure 5.7. For tickets of the MRT3 costing at 14 and 15 pesos, respondents are willing to pay a minimum of 16 Pesos up to a maximum of 28 Pesos to ride the MRT3. Same as the lower fare analysis, respondents are willing to pay more than what they pay at the moment. The summary of KLP price results for a 14 and 15 Peso ticket price can be seen on Table 5.13.

Table 5.13 KLP Price Results for a 14 and 15 Pesos Ticket Price for the MRT3

Minimum Price	16.00 Pesos
Standard Price	18.00 Pesos
Reasonable Price	18.00 Pesos
Maximum Price	28.00 Pesos
Sense of Reasonability	16.00 to 18.00 Pesos
Acceptable Price Range	16.00 to 28.00 Pesos

KLP analysis by income for the upper fare of the MRT3 users show that low income users can pay from 15.00 Pesos to 25.00 Pesos. Higher income users, on the other hand, can pay a minimum of 16.00 Pesos to a maximum of 28.00 Pesos. A summary is shown in Table 5.14.

Table 5.14 KLP Price Results by Income for 14 and 15 Pesos Ticket Price for the MRT3

	Low Income Users	**High Income Users**
Minimum Price	15.00 Pesos	16.00 Pesos
Standard Price	18.00 Pesos	17.00 Pesos
Reasonable Price	16.00 Pesos	19.00 Pesos
Maximum Price	25.00 Pesos	28.00 Pesos
Sense of Reasonability	15.00 to 18.00 Pesos	16.00 to 17.00 Pesos
Acceptable Price Range	15.00 to 25.00 Pesos	16.00 to 28.00 Pesos

5.1.2.2 Light Rail Transit Line 1 (LRT1)

Lower Fare Analysis

KLP analysis for the lower fare of the LRT1 was done for 449 of the 496 total respondents for the urban rail. Prices from 12 to 15 Pesos were considered for the lower fare analysis since they all have similar KLP results when analyzed individually. Equations 31 to 34 represents the equations from the logit model of the KLP.

T_1; Should be less expensive $= -0.257x + 4.365 \;\; (R^2 = 0.79)$ (31)

T_2; Should be more expensive $= 0.171x - 3.492 \;\; (R^2 = 0.81)$ (32)

T_3; Too expensive to be WTP $= -0.141x + 3.694 \;\; (R^2 = 0.76)$ (33)

T_4; Too cheap to be WTP $= 0.410x - 5.795 \;\; (R^2 = 0.89)$ (34)

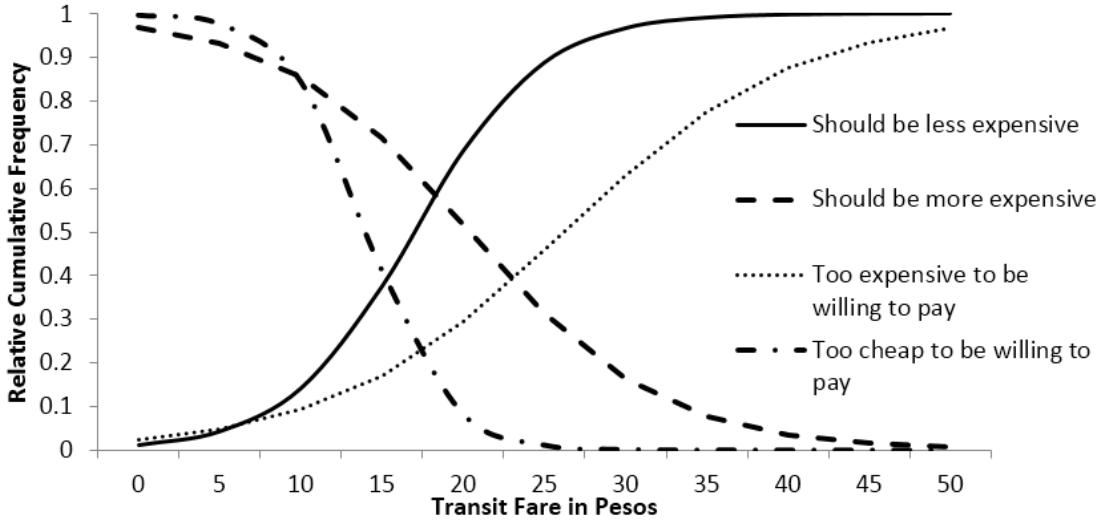


Figure 5.8 Price Indicator for a 12 to 15 Pesos Ticket Price for the LRT1

Price indicator for the 12 to 15 Pesos tickets are graphed given the logit equations in Figure 5.8. As seen in the results, 12 to 15 Peso tickets are quite low according to the preferences of LRT1 respondents since acceptable range is from 15 Pesos at the minimum and 23 Pesos as the maximum price. Nevertheless, it is still inside the acceptable range as well as the sense of reasonable range according to respondents of the LRT1. A reasonable price is at 18 Pesos, which most people feel is the best price given the quality of the urban rail system. Table 5.15 summarizes the prices analyzed from the KLP.

Table 5.15 KLP Price Results for a 12 to 15 Pesos Ticket Price for the LRT1

Minimum Price	15.00 Pesos
Standard Price	17.00 Pesos
Reasonable Price	18.00 Pesos
Maximum Price	23.00 Pesos
Sense of Reasonability	15.00 to 17.00 Pesos
Acceptable Price Range	15.00 to 23.00 Pesos

Upper Fare Analysis

For the upper fare analysis of the LRT1, 47 respondents were considered in the analysis. 20 Pesos is the highest ticket price in all the urban rails in Manila, hence, it is considered as the upper fare for the LRT1. Logit equations for the upper fare of the LRT1 are summarized in equations 35 to 38 and relative cumulative frequency are graphed versus the transit fare in Figure 5.9 to create the price indicator for the KLP. Notice that the lines of "Should be less expensive" and "Too expensive to be willing to buy" are close to each other especially where they intersect the "Too cheap to be willing to buy" line. Results show that the minimum price is close to the reasonable price.

T_1; Should be less expensive $= -0.287x + 7.727 \ (R^2 = 0.99)$ (35)

T_2; Should be more expensive $= 0.208x - 5.676 \ (R^2 = 0.93)$ (36)

T_3; Too expensive to be WTP $= -0.162x + 5.222 \ (R^2 = 0.97)$ (37)

T_4; Too cheap to be WTP $= 0.409x - 7.339 \ (R^2 = 0.93)$ (38)

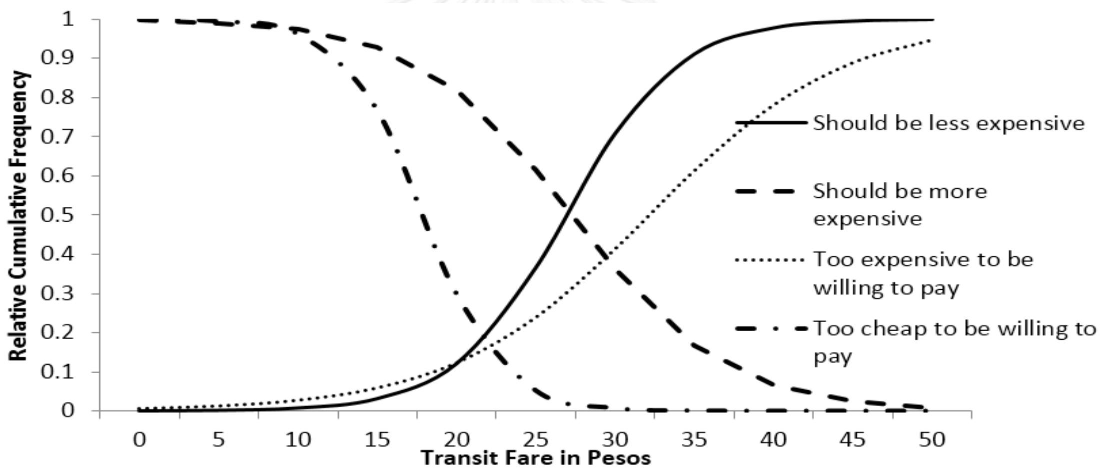


Figure 5.9 Price Indicator for a 20 Pesos Ticket Price for the LRT1

KLP analysis show that respondents feel that the minimum price of a 20 Pesos ticket price should be at 22 Pesos, although a reasonable price for the ticket is not far to what the minimum is. The standard price is at 27 Pesos where at this price, the quality and the price are well balanced given the distance travelled with the 20 Pesos ticket. Note that the 20 Pesos ticket is quite new to the system since it serves the newest stations of the LRT1 from the southbound end stations, hence, a higher standard price was obtained. Lastly, the maximum price respondents could pay is at 29 Pesos and sense of reasonability range is from 22 to 27 Pesos. Table 5.16 summarizes the KLP prices for the 20 Pesos ticket of the LRT1.

Table 5.16 KLP Price Results for a 20 Pesos Ticket Price for the LRT1

Minimum Price	22.00 Pesos
Standard Price	27.00 Pesos
Reasonable Price	23.00 Pesos
Maximum Price	29.00 Pesos
Sense of Reasonability	22.00 to 27.00 Pesos
Acceptable Price Range	22.00 to 29.00 Pesos

For the analysis of KLP by income, only the lower fare was considered since the upper fare for the LRT1 shows discrepancy in the KLP results due to the small amount of users using the 20 Pesos ticket. Table 5.17 summarizes the KLP price results by income for the LRT1 users. There is almost no difference in the KLP results by income for both low income and high income users wherein both groups can pay from 15.00 Pesos and higher income users can pay just 1.00 higher for the maximum price.

Table 5.17 KLP Price Results by Income for 12 to 15 Pesos Ticket Price for the LRT1

	Low Income Users	**High Income Users**
Minimum Price	15.00 Pesos	15.00 Pesos
Standard Price	17.00 Pesos	18.00 Pesos
Reasonable Price	18.00 Pesos	18.00 Pesos
Maximum Price	22.00 Pesos	23.00 Pesos
Sense of Reasonability	15.00 to 17.00 Pesos	15.00 to 18.00 Pesos
Acceptable Price Range	15.00 to 22.00 Pesos	15.00 to 23.00 Pesos

5.1.2.3 Light Rail Transit Line 2 (LRT2)

The newest urban rail system in Manila is the Light Rail Transit 2 or the LRT2 where 483 respondents were gathered during data collection. After analyzing all ticket prices for the LRT2, which ranges from 12 to 15 Pesos only, it was observed that all tickets have similar KLP results, hence all ticket prices were analyzed as a group. Equations 39 to 42 are the logit equations used for the KLP analysis. These were again used to graph the relative cumulative frequency of all four prices of KLP by the transit fare. Price indicator for the LRT2 ticket prices are created as seen in Figure 5.10.

T_1; Should be less expensive $= -0.581x + 9.482 \ (R^2 = 0.85)$ (39)

T_2; Should be more expensive $= 0.135x - 2.890 \ (R^2 = 0.74)$ (40)

T_3; Too expensive to be WTP $= -0.109x + 3.199 \ (R^2 = 0.71)$ (41)

T_4; Too cheap to be WTP $= 0.292x - 4.714 \ (R^2 = 0.73)$ (42)

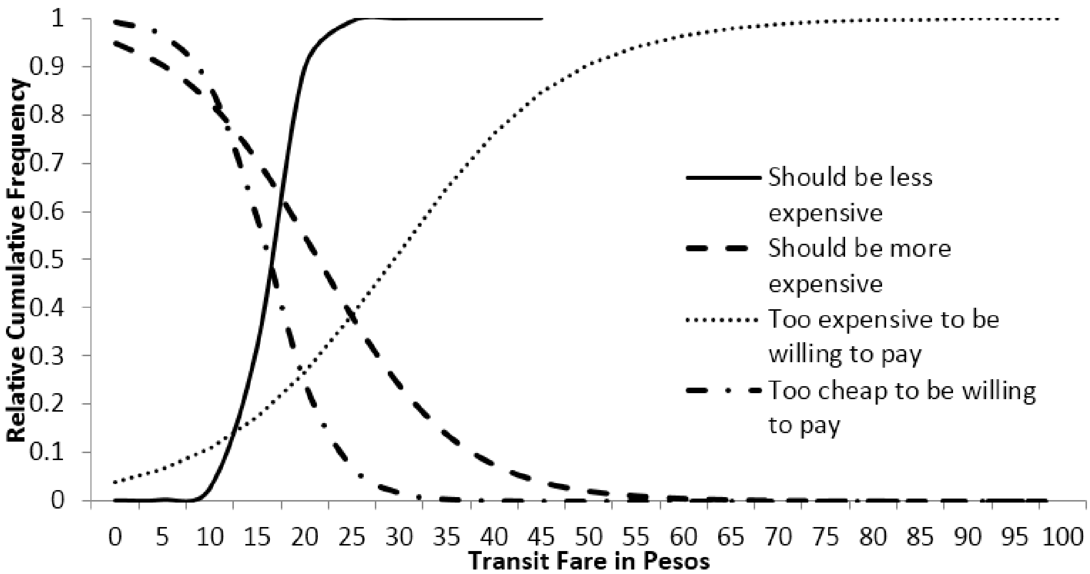


Figure 5.10 Price Indicator for Ticket Prices for the LRT2

A reason that the lines for the “Should be less expensive” and “Too cheap to be willing to pay” lines are somewhat steep is because prices suggested by respondents have little disparity, hence, there are only a few relative cumulative frequencies created. Also, since prices of the LRT2 are too close to each other, respondents tend to select reasonable prices and too cheap to be willing to pay prices with minimal choices (e.g. a 12 Pesos ticket are already reasonable for respondents and 10 Pesos are their minimum suggestions since other public transportation costs 8 Pesos like the Jeepneys). Results tend to be defective due to the limited price choices of respondents which may be because of the very limited current ticket prices which is 12 to 15 only. Nevertheless, the minimum price that respondents will pay is 16 Pesos and ta maximum of 25 Pesos for all tickets of the LRT2. Table 5.18 summarizes the KLP ticket prices for the LRT2.

Table 5.18 KLP Price Results for Ticket Prices for the LRT2

Minimum Price	16.00 Pesos
Standard Price	17.00 Pesos
Reasonable Price	20.00 Pesos
Maximum Price	25.00 Pesos
Sense of Reasonability	16.00 to 17.00 Pesos
Acceptable Price Range	16.00 to 25.00 Pesos

Shown in Table 5.19 are the KLP analysis by income for the LRT2. Comparing both low income and high income users, they both can pay a minimum of 16.00 Pesos. A difference of 1.00 Peso can be seen wherein higher income users can pay a maximum of 25.00 Pesos compared to the maximum price of low income users which is 24.00 Pesos.

Table 5.19 KLP Price Results by Income for Ticket Prices for the LRT2

	Low Income Users	**High Income Users**
Minimum Price	16.00 Pesos	16.00 Pesos
Standard Price	20.00 Pesos	18.00 Pesos
Reasonable Price	16.00 Pesos	19.00 Pesos
Maximum Price	24.00 Pesos	25.00 Pesos
Sense of Reasonability	16.00 to 20.00 Pesos	16.00 to 18.00 Pesos
Acceptable Price Range	16.00 to 24.00 Pesos	16.00 to 25.00 Pesos

5.1.3 KLP Comparison between Bangkok and Manila Rails

The Bangkok rail systems are similar when it comes to the KLP results. All trains have ticket prices, whether it is lower fare or upper fare, inside the acceptable range after KLP analysis was done. This means that Bangkok urban rail systems are already properly priced based on the KLP analysis which came from the preferences of the urban rail users. Also, the lower fares of both BTS and MRT are inside the sense of reasonability range while the upper fares are outside the range. This indicates that the lower fares are priced reasonably, while the upper fares are above the reasonable price yet still inside the acceptable range. Overall, the Bangkok urban rails have balanced quality and ticket pricing.

For the Manila rails, all urban rail systems also have similar KLP results. The MRT3, LRT1 and the LRT2 are priced too low since all ticket prices are not within the acceptable range. Even though ticket prices in Manila are subsidized by the government, people feel that they can pay more given the quality/service of the urban rail systems. Suggested prices by the KLP are good considerations when a price increase will be implemented.

With the KLP results from both study areas, it can be observed that the ticket pricing in Bangkok are already within the acceptable preferences of urban rail users, while Manila ticket pricing are too low for the users. All the prices analyzed by the KLP can be suggestions on how much or how low to increase or decrease a ticket price when a change in transit fare is to be done.

Table 5.20 summarizes all ticket prices analyzed by the KLP in Thailand Baht to further compare the preferred prices from both cities (Manila rail KLP results are also shown in Philippine Peso). This will show how people in both countries perceive the ticket prices of urban rails given the current ticket pricing. For the Bangkok rails, the lowest ticket price that the rail users can pay in any given urban rail in Bangkok is about 23 Baht which was obtained from the MRT lower fare analysis. Comparing with the Manila rails' KLP maximum ticket price in any given Manila urban rail, people could pay at most 21.36 Baht obtained from the LRT1 upper fare analysis. The maximum amount to be paid in Manila rail is still less than the minimum of Bangkok rails.

A possible reason on why Manila urban rail users still have low urban rail ticket price preference compared to Bangkok rail users may be because of the quality and service of Manila rails are below average compared to the better quality and services of Bangkok rails. Another reason may be because the urban rail users in Manila are so used with the subsidized ticket prices that the users would not suggest a bigger jump in ticket price at the moment.

Table 5.20 KLP Results for Bangkok and Manila

	Bangkok Urban Rail Systems (in Thai Baht)				
	BTS		MRT		ARL
	Lower fare	Upper fare	Lower fare	Upper fare	30 Baht
Maximum Price	35.00	49.00	34.00	44.00	38.00
Standard Price	29.00	42.00	26.00	39.00	30.00
Reasonable Price	26.00	40.00	26.00	39.00	31.00
Minimum Price	24.00	35.00	23.00	34.00	27.00

	Manila Urban Rail Systems (in Thai Baht)				
	MRT3		LRT1		LRT2
	Lower fare	Upper fare	Lower fare	Upper fare	All Tickets
Maximum Price	18.41	20.62	16.94	21.36	18.41
Standard Price	13.26	13.26	13.26	19.88	12.52
Reasonable Price	11.05	13.26	12.52	16.94	14.73
Minimum Price	9.57	11.78	11.05	16.20	11.78

	Manila Urban Rail Systems (in Philippine Peso)				
	MRT3		LRT1		LRT2
	Lower fare	Upper fare	Lower fare	Upper fare	All Tickets
Maximum Price	25.00	28.00	23.00	29.00	25.00
Standard Price	18.00	18.00	17.00	27.00	17.00
Reasonable Price	15.00	18.00	18.00	23.00	20.00
Minimum Price	13.00	16.00	15.00	22.00	25.00

The income level is considered in the analysis of the KLP to see the effects it makes to a user's price preference for the urban rail systems. Table 5.21 summarizes the KLP results when the income is considered, which is either low income users or high income users. It can be seen that for the lower fares of the rail systems in Bangkok, there is not much difference except that high income users could pay 1 Baht more for their maximum price. Although, for the upper fares of the BTS and the MRT as well as the ARL, a big difference can be seen when low income users and high income users are separated. Both minimum and maximum prices can be higher for the high income users.

Table 5.21 KLP Results by Income Level for Bangkok and Manila

Tickets	Income Level	Acceptable Price Range (Minimum to Maximum)	
		Lower Income Users	Higher Income Users
BTS	Lower fare	23.00 to 35.00 Baht	23.00 to 36.00 Baht
	Upper fare	34.00 to 44.00 Baht	35.00 to 50.00 Baht
MRT	Lower fare	23.00 to 33.00 Baht	23.00 to 34.00 Baht
	Upper fare	34.00 to 44.00 Baht	36.00 to 45.00 Baht
ARL	30 Baht tickets	27.00 to 34.00 Baht	35.00 to 40.00 Baht
MRT3	Lower fare	13.00 to 22.00 Pesos	13.00 to 25.00 Pesos
	Upper fare	15.00 to 25.00 Pesos	16.00 to 28.00 Pesos
LRT1	All tickets	15.00 to 22.00 Pesos	15.00 to 23.00 Pesos
LRT2	All tickets	16.00 to 24.00 Pesos	16.00 to 25.00 Pesos

For the Manila urban rails, also shown in Table 5.21, the income level does not have that much effect on the analysis of the KLP by income. Almost all minimum prices are the same whether for low income users or high income users except for the upper fare of the MRT3 wherein high income users could pay 1 peso more for their minimum price. The maximum price, on the other hand, shows that high income users could pay as much as 3 pesos more the MRT3 users, while 1 peso more for both LRT lines.

5.2 Price Elasticity Estimates

The data used in the analysis of estimating the elasticity were from all urban rail transit systems in both Bangkok and Manila. A total of 1321 samples were analyzed for the Bangkok urban rail systems while 1478 total samples were used to analyze Manila urban rail systems. Price elasticity were obtained for all 6 urban rail systems to see individual results. At the same time, price elasticity by country were also obtained to see the effects of a price change of an urban rail system as a country.

Respondents were asked a question that will identify their willingness to pay for an urban rail ticket pertaining to their usual origin and destination. These were then used to estimate the price elasticity where the dependent variable is the demand and the independent variable is the maximum amount they are willing to pay. From the methodology of price elasticity, it was shown that the log-log function will be used to estimate the price elasticity. Logarithmic values of the demand were used as well as the logarithmic values of the maximum willingness to pay amount to estimate the price elasticity.

Table 5.22 Urban Rail Price Elasticity in Bangkok and Manila

	Bangkok Urban Rail Systems			Bangkok, Thailand
	BTS	MRT	ARL	
Price Elasticity	-2.518	-2.483	-2.864	-2.537

	Manila Urban Rail Systems			Manila, Philippines
	MRT3	LRT1	LRT2	
Price Elasticity	-1.033	-1.914	-2.184	-2.051

The estimated urban rail price elasticity for all urban rail systems in Bangkok and Manila as well as the urban rail price elasticity by country can be seen in Table 5.22. According to Sharaby and Shiftman (2012) the average urban rail price elasticity obtained from numerous studies, mostly in the United States and in Europe which are also mostly revealed preference surveys and reviewed surveys, averages at -0.30 to -0.60. It can be observed that all urban rail systems in Bangkok and Manila exceeds the price elasticity average done from urban rails around the world. As a country, Thailand urban rails have price elasticity of -2.537. On the other hand, Manila price elasticity obtained, which is at -2.051, were lower compared to Bangkok price elasticity but still exceeds different other studies. This signifies that respondents in Manila are less sensitive to a price change compared to Bangkok rail users. Both Bangkok and Manila price elasticity are very high wherein prices are based on their willingness to pay (Stated Preference). This means that urban rail users from Bangkok and Manila are very sensitive to price increases. A revealed preference study would show a clearer price elasticity value since a price increase would have already been implemented.

Looking at the individual price elasticity for every urban rail, it can be seen that for the Bangkok urban rails, the BTS and the MRT have similar price elasticity compared to the ARL. The BTS and the MRT are the older rail systems in Bangkok, hence, a lower price elasticity is sensible since people are already used with the system. As for the ARL, the system was not in normal operation when data gathering was done which may have increased the price elasticity compared to the two other rail systems.

For the LRT1 and the LRT2 in Manila, they have similar price elasticity but higher price elasticity compared to the MRT3, wherein the MRT3 is the most used urban rail system in Manila due to the numerous CBD's it traverses. MRT3 users are less sensitive whenever a price increase will happen compared to the other two urban rails with a price elasticity of -1.033.

5.3 Recent Changes in Manila's Transit Fare

On January 4, 2015, the Department of Transportation and Communications in the Philippines implemented an increase of transit fare for all three urban rail systems in Metro Manila. According to the Department of Transportation and Communications or DOTC (2015), the new ticket prices will follow a base fare of 11 Pesos and additional 1 Peso for every kilometer travelled but still following increments of 5 Pesos for LRT systems as seen in Figure 5.11 and 5.12. Instead of having the lowest fare as 10 Pesos from the older transit fares, the current lowest fare is now at 13 Pesos and 15 Pesos for the MRT3 and LRT, respectively. A maximum amount of 28 Pesos is implemented for the MRT3 while intervals of 5 Pesos are implemented in the LRT systems which will reach up to a maximum of 25 Pesos and 30 Pesos for the LRT2 and LRT1, respectively. It should be noted that the research was done before the implementation of the price hike for the urban rails in Manila.

With the recent transit fare hike in Manila, a comparison between the KLP results and the newly implemented transit fares can be done. It was seen with the KLP results that the LRT1 can have a minimum price of 15 Pesos to a maximum of 23 Pesos for the lower fares (12 to 15 Pesos) while the upper fare for the LRT1 (20 Pesos) can have a minimum of 22 pesos up to a maximum of 29 Pesos. As seen in Figure 5.11, the LRT1's revised transit fares ranges from 15 to 30 Pesos compared to the KLP resulss which is ranged from 15 to 29 Pesos. As for the LRT2 KLP analysis, the minimum price is at 16 Pesos to a maximum of 25 Pesos. Comparing it with the new transit fares, the lowest ticket price for the LRT2 is 15 Pesos and the most expensive ticket is at 25 Pesos as seen in Figure 5.12. Similar comparisons are seen with the MRT3 where the range of prices from KLP is from 13 Pesos to 28 Pesos and newly implemented fare hike ticket prices are also ranged from 13 to 28 Pesos as seen in Figure 5.13. Results show that the KLP analysis have similar prices with the new ticket prices for the LRT1, LRT2 and MRT3. With the similar results of the KLP analysis and the new ticket prices, the newly implemented system should be considered a good implementation based on this research. A before and after analysis is suggested to further support the research since this research is based on the preferences of urban rail commuters.

	Ba	ED	Li	GP	VC	Qu	PG	UN	CT	Ca	DJ	Bm	Ta	Bl	AS	RP	5A	Mo	Bw	Rv
Baclaran		15	15	15	15	15	20	20	20	20	20	20	30	30	30	30	30	30	30	30
EDSA	15		15	15	15	15	15	20	20	20	20	20	20	30	30	30	30	30	30	30
Libertad	15	15		15	15	15	15	15	20	20	20	20	20	20	30	30	30	30	30	30
G. Puyat	15	15	15		15	15	15	15	20	20	20	20	20	20	20	30	30	30	30	30
V. Cruz	15	15	15	15		15	15	15	15	15	20	20	20	20	20	20	30	30	30	30
Quirino	15	15	15	15	15		15	15	15	15	15	20	20	20	20	20	20	30	30	30
P. Gil	20	15	15	15	15	15		15	15	15	15	15	20	20	20	20	20	20	30	30
UN Ave.	20	20	15	15	15	15	15		15	15	15	15	15	20	20	20	20	20	30	30
C. Terminal	20	20	20	20	15	15	15	15		15	15	15	15	15	15	20	20	20	20	30
Carriedo	20	20	20	20	15	15	15	15	15		15	15	15	15	15	15	20	20	20	30
D. Jose	20	20	20	20	20	15	15	15	15	15		15	15	15	15	15	15	20	20	30
Bambang	20	20	20	20	20	20	15	15	15	15	15		15	15	15	15	15	20	20	20
Tayuman	30	20	20	20	20	20	20	15	15	15	15	15		15	15	15	15	15	20	20
Blumentritt	30	30	20	20	20	20	20	20	15	15	15	15	15		15	15	15	15	20	20
Abad Santos	30	30	30	20	20	20	20	20	15	15	15	15	15	15		15	15	15	20	20
R. Papa	30	30	30	30	20	20	20	20	20	15	15	15	15	15	15		15	15	15	20
5th Ave.	30	30	30	30	30	20	20	20	20	20	15	15	15	15	15	15		15	15	20
Monumento	30	30	30	30	30	30	20	20	20	20	20	20	15	15	15	15	15		15	15
Balintawak	30	30	30	30	30	30	30	30	20	20	20	20	20	20	20	15	15	15		15
Roosevelt	30	30	30	30	30	30	30	30	30	30	30	20	20	20	20	20	20	15	15	

Figure 5.11 Revised LRT1 Fare Matrix as of Jan. 4, 2015 (DOTC, 2015)

	Re	Le	Pu	VM	JR	Gi	BG	AC	An	Ka	Sa
Recto		15	15	15	20	20	20	20	25	25	25
Legarda	15		15	15	15	20	20	20	20	25	25
Pureza	15	15		15	15	15	20	20	20	20	25
V. Mapa	15	15	15		15	15	15	20	20	20	25
J. Ruiz	20	15	15	15		15	15	15	20	20	20
Gilmore	20	20	15	15	15		15	15	15	20	20
Betty Go-Belmonte	20	20	20	15	15	15		15	15	15	20
Araneta - Cubao	20	20	20	20	15	15	15		15	15	15
Anonas	25	20	20	20	20	15	15	15		15	15
Katipunan	25	25	20	20	20	20	15	15	15		15
Santolan	25	25	25	25	20	20	20	15	15	15	

Figure 5.12 Revised LRT2 Fare Matrix as of Jan. 4, 2015 (DOTC, 2015)

	NA	QA	Ka	Cu	Sa	Or	Sh	Bo	Gu	Bu	Ay	Ma	Ta
North Ave		13	13	16	16	20	20	20	24	24	24	28	28
Quezon Ave	13		13	13	16	16	20	20	20	24	24	24	28
Kamuning	13	13		13	13	16	16	20	20	20	24	24	24
Cubao	16	13	13		13	13	16	16	20	20	20	24	24
Santolan	16	16	13	13		13	13	16	16	20	20	20	24
Ortigas	20	16	16	13	13		13	13	16	16	20	20	20
Shaw	20	20	16	16	13	13		13	13	16	16	20	20
Boni	20	20	20	16	16	13	13		13	13	16	16	20
Guadalupe	24	20	20	20	16	16	13	13		13	13	16	16
Buendia	24	24	20	20	20	16	16	13	13		13	13	16
Ayala	24	24	24	20	20	20	16	16	13	13		13	13
Magallanes	28	24	24	24	20	20	20	16	16	13	13		13
Taft	28	28	24	24	24	20	20	20	16	16	13	13	

Figure 5.13 Revised MRT3 Fare Matrix as of Jan. 4, 2015 (Metro Rail Transit, 2015)

Chapter 6
Conclusions and Recommendations

6.1 Conclusions

This study seeks to obtain and compare the travel behavior of urban rail passengers especially when a change in transit fare is implemented specifically in Bangkok, Thailand and Manila, Philippines who have three urban rail systems each. Given the descriptive statistics for each urban rail system, this research was able to determine the characteristics of urban rail passengers for both Bangkok and Manila. To understand the behavior of urban rail users when a change in transit fare is implemented, the urban rail price elasticity is estimated to determine the sensitivity of passengers to a price change. Lastly, to further understand how much urban rail passengers are willing to pay for a ticket, a range of reasonable price ranges are estimated using the Kishi's Logit PSM which is based on the preferences of commuters.

Interesting results obtained from the descriptive statistics that would characterize Bangkok and Manila rail passengers were seen from the passenger's monthly income, vehicle ownership, and satisfaction with the current urban rail systems in both study areas. As for the monthly income of passengers, it was observed that Bangkok urban rail users come from every level of income, whether they have very low income, medium income to high income earners. On the other hand, Most of the Manila urban rail users are very low to medium income earners only. For vehicle ownership, Bangkok urban rail users patronize the trains despite having a large proportion of car ownership where 85% of the respondents own cars while most Manila urban rail users are non-car owners at about 55%. Monthly income and vehicle ownership of urban rail users in Bangkok can describe how well balanced the urban rails are in terms of serving all levels of income earners and having urban rails as a mode choice for many despite having cars. This leads to how urban rail users see the quality and service of the urban rail systems in Bangkok and Manila. At a rate of 1 to 5, 1 being not satisfied at all and 5 being extremely satisfied, Bangkok urban rail users rate their trains at 4 and 3 while Manila urban rail users rate their trains mostly at 3 and 2. Respondents not satisfied with urban rails reaches 15% of the total respondents for the Manila urban rails while Bangkok respondents have about only 1% not satisfied. This shows how worse the quality and service is for the Manila urban rails compared to the Bangkok urban rails.

With the current quality and service of the urban rails, users were asked how high they were willing to pay to ride the urban rails. This information obtained the price elasticity estimates of urban rails in both Bangkok and Manila. Bangkok users have high price elasticity which is -2.537 compared to a lot of urban rail studies done which averages at -0.30 to -0.60 according to Sharaby and Shiftan (2012). Manila urban rail price elasticity obtained was at -2.051 which is also higher compared to the other studies but it is lower compared to the Bangkok price elasticity. This shows that urban rail users in Bangkok will be more sensitive when a price increase is implemented compared to Manila urban rail users, although, both results show that both urban rail systems in both countries will have very sensitive urban rail users when price changes are implemented. This study uses the willingness to pay of urban rail users, hence, a revealed preference survey will improve the value of the price elasticity since it will show the true ridership of the systems after a price change is implemented. Based on the price elasticity obtained, users in both Bangkok and Manila are not in favor of a price increase at the moment. This means that many urban rail users feel that they will not ride the systems anymore once the prices are increased.

Preferences of urban rail users were obtained to see how low or how high are they willing to pay for the urban rail systems. Using the Kishi's logit PSM, a range of reasonable prices based on user's preferences were obtained. For the Bangkok urban rails, the BTS ticket prices could range from 24 to 49 Baht given that they pay for 25 baht and 42 Baht tickets, the MRT ticket prices could range from 23 to 44 Baht given that they pay for 25 and 40 Baht tickets, and ARL ticket prices could range from 27 to 38 Baht given that they pay for 30 Baht tickets. This shows that the current ticket prices are already reasonable for the urban rail passengers of Bangkok since all ticket prices are inside of what users feel are acceptable. For the Manila urban rails, MRT3 tickets could range from 13 to 28

Pesos given the current prices of the MRT3, the LRT1 tickets could range from 15 to 29 Pesos given the current LRT1 ticket prices, and the LRT2 tickets can range from 16 to 25 Pesos given the current LRT2 ticket prices. Current ticket prices of Manila urban rails are too low according to the urban rail users.

KLP analysis was also done by income levels which were separated by lower income users and the upper income users. This was to see whether the income levels of urban rail users will have an effect in the user's price preference to a ticket. Results show that the higher income users would pay more for a ticket compared to the lower income users. The effect of the income levels of the Bangkok urban rail users are more significant compared to the urban rail users in Manila.

6.2 Recommendations

The effectiveness of the KLP can be seen by further research since an increase in transit fare of the urban rails in Manila has just been recently established. As seen in section 5.3 in this research paper, KLP estimates are exactly the same as the price increase recently implemented. Since the KLP is based on the preferences of the passengers before an implementation is made, an after analysis would justify the effectiveness of the increase in transit fare.

The KLP can be a good tool to estimate future projects that focuses on price estimates. Specifically, this research recommends that the KLP can be a good estimate to future urban rail projects with the same city setting and characteristics with Bangkok and Manila especially in the South East Asian region. Price elasticity can also be a basis on how high or how low can price estimates reach to gather future transit users in the most optimum way.

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APPENDIX

Survey on Commuter's Preference on Transit Fare Pricing for the BTS Sky Train

Good day! We are Transportation Engineering graduate students from Chulalongkorn University. We would like to conduct this survey about commuter's preference on the pricing of transit fare for the BTS Sky Train. Your answers will be helpful and useful for the improvement of the urban rail system in the future. Respondent's personal information will be kept confidential and will be used only for academic purposes. Thank you for your cooperation!

Please put a check (√) in the box that corresponds to your answer

Household Information

1. Gender:
   □ Male □ Female
2. Age: ______
3. Marital Status:
   □ Single □ Married □ Others
4. Occupation:
   □ Student
   □ Employee
   □ Business Owner
   □ Independent Professional
   □ Others
5. Monthly Income (in Baht):
   □ Less than 9,000
   □ 9,000 to 15,000
   □ 15,001 to 30,000
   □ 30,001 to 50,000
   □ More than 50,000
6. Household Members: _____
   (Number of all members living together)
7. Household Income (in Baht):
   (Total Income of all members living together)
   □ Less than 25,000
   □ 25,000 to 45,000
   □ 45,001 to 65,000
   □ 65,001 to 85,000
   □ 85,001 to 100,000
   □ More than 100,000
8. Number of Cars Owned: _____
9. Number of Motorcycles Owned: _____
10. Are you the head of your household?
    □ Yes □ No

Urban Rail Transit Information

11. How often do you use the BTS Sky train?
    □ Often ____ times/week
    □ Sometimes ____ times/month
    □ Rarely (Less than the choices given)
12. What kind of ticket do you use in riding the BTS Sky train?
    □ Single Journey Ticket
    □ Smart Pass Ticket (Stored Value)
    □ Smart Pass Ticket (Period pass)
13. What is your usual BTS origin station?
    -
    ____
    __
14. What is your usual BTS destination station?
    ____
15. What is your usual purpose in using the BTS Sky Train?
    □To go to work/school
    □For leisure only

Please give a value for the following questions:

16. From your usual origin and destination stations, how much do you pay?
    ____
    Baht
17. From your answer in Number 16, do you think this fare price is reasonable?
    □ Yes
    □ No, a reasonable price is
    _______Baht
18. What amount do you think is expensive based on your usual route?
    _______ Baht
19. What is the highest amount you would pay based on your usual route?
    _______ Baht
20. What is the lowest amount you would pay based on your usual route? (keep in mind the quality of service)
    _______ Baht
21. Are you satisfied with the overall service of the BTS Sky train?
    □ Extremely Satisfied
    □ Very Satisfied
    □ Moderately Satisfied
    □ Slightly Satisfied
    □ Not at all Satisfied

Surveyor..........
No....................
Station.................

Transportation Engineering Division
Chulalongkorn University

แบบสำรวจความพึงพอใจของผู้โดยสารต่ออัตราค่าโดยสารในการขนส่งระบบรางในเมือง

แบบสำรวจนี้จัดทำขึ้นเพื่อสำรวจความพึงพอใจของผู้โดยสารต่ออัตราค่าโดยสารในการใช้บริการระบบBTS, MRT และ Airport Rail Link ซึ่งคำตอบของท่านจะเป็นประโยชน์ต่อการนำข้อมูลไปใช้เพื่อพัฒนาและปรับปรุงการขนส่งระบบรางในเมืองในอนาคตต่อไป สำหรับข้อมูลส่วนบุคคลของท่านจะถูกเก็บรักษาไว้เป็นความลับและนำไปใช้เพื่อการศึกษาวิจัยเท่านั้น ขอบคุณสำหรับความร่วมมือในการตอบแบบสอบถาม

โปรดใส่เครื่องหมายถูกต้อง (√) ในช่องที่ท่านต้องการเลือก

ข้อมูลเกี่ยวกับครัวเรือน

1. เพศ :

☐ ชาย ☐ หญิง

2. อายุ : ______

3. สถานภาพการสมรส ☐ โสด ☐ แต่งงานแล้ว ☐ อื่นๆ

4. อาชีพ:

☐ นักเรียน/นิสิต/นักศึกษา ☐ อาชีพอิสระ

☐ พนักงานบริษัท/รับจ้าง/ข้าราชการ ☐ อื่นๆ

☐ ธุรกิจส่วนตัว

5. รายได้ต่อเดือน (บาท):

☐ น้อยกว่า 9,000 ☐ 30,001 ถึง 50,000

☐ 9,000 ถึง 15,000 ☐ มากกว่า 50,000

☐ 15,001 ถึง 30,000

6. จำนวนสมาชิกในครัวเรือน: _____

(จำนวนของสมาชิกที่อาศัยอยู่ด้วยกัน)

7. รายได้ต่อเดือนของครอบครัว (บาท):

(รายได้รวมทั้งหมดของสมาชิกที่อาศัยอยู่ด้วยกัน)

☐ น้อยกว่า 25,000 ☐ 65,001 ถึง 85,000

☐ 25,000 ถึง 45,000 ☐ 85,001 ถึง 100,000

☐ 45,001 ถึง 65,000 ☐ มากกว่า 100,000

8. จำนวนรถยนต์ในการครอบครองของครัวเรือน: _____

9. จำนวนรถจักรยานยนต์ของครัวเรือน: _____

10. ท่านเป็นหัวหน้าครอบครัวหรือไม่ ☐ ใช่ ☐ ไม่ใช่

ข้อมูลการใช้บริการ

11. ความถี่ในการใช้บริการระบบรถไฟฟ้าMRT

☐ เป็นประจำ____ครั้ง/สัปดาห์

☐ เป็นครั้งคราว____ครั้ง/เดือน

☐ นานๆครั้ง (น้อยกว่า 2 ตัวเลือกข้างต้น)

12. ประเภทของบัตรโดยสารที่ท่านใช้เป็นประจำ

☐ ตั๋วโดยสารเที่ยวเดียว

☐ บัตรโดยสารเติมเงิน สำหรับนักเรียน/นักศึกษา

☐ บัตรโดยสารเติมเงิน สำหรับบุคคลธรรมดา

☐ บัตรโดยสารเติมเป็นเที่ยว สำหรับนักเรียน____เที่ยว

☐ บัตรโดยสารเติมเป็นเที่ยว สำหรับบุคคลธรรมดา____เที่ยว

13. สถานี MRT ต้นทางที่ท่านใช้เป็นประจำคือ__________

14. สถานี MRT ปลายทางที่ท่านใช้เป็นประจำ คือ_________

15. วัตถุประสงค์ของการเดินทางด้วย MRT

☐ ไปทำงาน/ไปเรียน/ทำธุระส่วนตัว

☐ ไปเที่ยว/ซื้อของ

16. ท่านต้องเดินทางด้วยบริการ BTS/SARL/BRT ต่อใช่หรือไม่

☐ ใช่ คือ__________ ☐ ไม่ใช่

โปรดระบุตัวเลขลงในคำถามต่อไปนี้:

17. ค่าโดยสารในการเดินทางจากสถานีต้นทางเพื่อไปยังสถานีปลายทางของท่าน_____________บาท

18. จากข้อ 16 ท่านคิดว่าค่าโดยสารนั้นสมเหตุสมผลแล้วใช่หรือไม่

☐ ใช่ ☐ ไม่ใช่, ราคาที่สมเหตุสมผลคือ_____บาท

19. ค่าโดยสารเท่าไหร่ที่ท่านคิดว่าแพง สำหรับเส้นทางที่ท่านใช้บริการ______บาท

20. ค่าโดยสารสูงสุดที่ท่านยินดีจะจ่ายในเส้นทางที่ท่านใช้บริการ______บาท

21. ค่าโดยสารต่ำสุดที่ท่านคิดว่าเหมาะสมในเส้นทางที่ท่านใช้เมื่อเปรียบเทียบกับคุณภาพการให้บริการ______บาท

22. ท่านมีความพึงพอใจต่อระบบการให้บริการโดยรวมของระบบรถไฟฟ้า MRT เป็นอย่างไรบ้าง

☐ พึงพอใจมากที่สุด ☐ พึงพอใจน้อย

☐ พึงพอใจมาก ☐ พึงพอใจน้อยที่สุด

☐ พึงพอใจปานกลาง

VITA

Marcus Kyle T. Baron was born on December 10, 1990, in Camden, New Jersey, USA. In 1991, he went to the Philippines where he resided and grew. In 2008, he finished his high school at La Salle Green Hills in Mandaluyong City, in the Philippines. On the same year, he entered De La Salle University Manila where he earned a degree "Bachelor of Science in Civil Engineering with specialization in Transportation Engineering" in the year 2013. Soon after he graduated, he was granted an AUN/SEED-Net scholarship to pursue a Master's degree in the field of Transportation Engineering, Civil Engineering, at Chulalongkorn University in Bangkok, Thailand. Marcus has planned to teach at his University in the Philippines and also to work abroad in the future and then eventually retire in the Philippines.