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CONSUMERS SATISFACTION OF PUBLIC TRANSPORT MONORAIL USER IN KUALA LUMPUR

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Abstract

Public transport which also called public transit includes various services using shared vehicles to provide mobility to the public. Public transport is important for the societal mobility and can knowingly play a role in reducing the problems related to several transport externalities such as accidents and traffic congestion. Kuala Lumpur City has experienced growth significantly better in the field of economic, social, and other, which resulted in more intensively urban activity that boosts the demand for public transport facilities will need sufficient city. Urban public transport facilities are secure, fast, comfortable and effective environment-friendly society in terms of operating or service will encourage residents and fluency activities into one of the indicators effective and successful cities. This research seeks to identify and explore the community and user satisfaction of the effectiveness of the public transportation system monorail service, which is a modern public transport in Kuala Lumpur, and to learn and take decisions that need to maintain service facilities or obtain performance improvements and development priorities. From studies that have been conducted show that the KL monorail public transport system has the potential and growing. The average number of passengers in 2012 was 66,765 passengers per day and 3,709 passengers per hour, the percentage increase in the average number of passengers between the years 2003-2012 amounted to 11.04%. From the analysis of the method Importance Performance Analysis of factors important facilities and services according to the respondents to maintain

satisfactory work performance, namely: Environmental and cleanliness in station, ticket counter, board information, punctuality of train arrival, cleanliness in the trains, security and installation of CCTV, reduce traffic congestion and environmental friendly. Factor facilities and services do not satisfy on the need to increase work performance: Waiting area and escalator down, seats provided in the train, comfort when boarding train, additional coach and routes to other places, parking and public transport at the surrounding area.

Keywords: Kuala Lumpur monorail, Passenger satisfaction, Importance performance analysis.

1. Introduction

Malaysia is a developing country where industry, commercial product, population and transported are being are developed, public transport are important for transportation of raw material and products as well as the movement people. Progress of the city of Kuala Lumpur depends on the development and effectiveness of public transport services. Public transport service is part of the basic infrastructure and essential in the development of a country [1]. As the capital of Malaysia, the city of Kuala Lumpur has one of the most modern transportation systems in this region. It has a comprehensive network of buses, taxis, monorail, light rail transit and commuter trains that provide convenient and quick access to various parts of this city and its surrounding, as shown in Fig. 1. As an effort to reduce congestion, limited parking, air pollution and aesthetics of a city public transport monorail should be developed as one alternative to solve these problems.

The monorail is a public transportation system based on the foundation/single track (mono) in the form of vehicles placed and served by a particular trajectory hovering above the ground [2]. Monorail technology can be classified into the People Rapid Transit (PRT) where the function is the same as LRT-Tren, which is to travel in the central city [3]. The detail monorail system structure diagram is shown in Fig. 2. The advantages of monorail systems such as requiring minimal space, not much interfere with existing traffic flow, more cost effective and time saving in the construction of the foundation/rail compared with a conventional runway [4, 5].

The major disadvantage of the monorail is the lack of flexibility in operation, due to its guideway-track configuration [6]. Meanwhile, monorails do also have several significant disadvantages that cannot be outright dismissed—like somewhat higher energy costs (for rubber-tired systems) and slower switching as compared with similar rail systems, it is rare that these considerations would amount to a "fatal-flaw". In fact, these considerations should, more often than not, be minor in the general exercise of mass-transit planning [4].

Meanwhile, the disadvantages of monorail systems such as monorail coaches are not the same as other rail types of infrastructure that should have a special foundation. When there is congestion passengers cannot be directly out of the coach, the safety team had to wait for the monorail located on high ground. Then next is cornering / turning at high speed rather difficult and the station must be united with the trajectory of not separate.

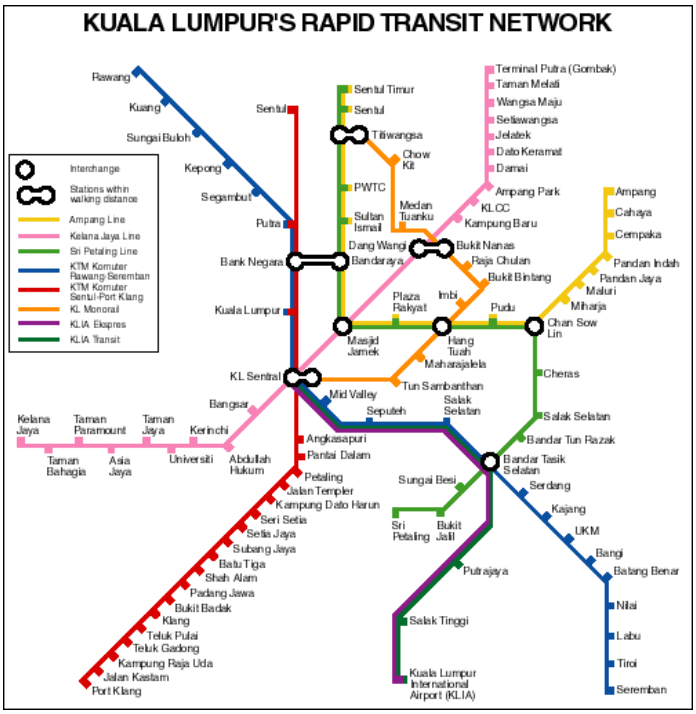

Fig. 1. Kuala Lumpur's Rapid Transit Network.

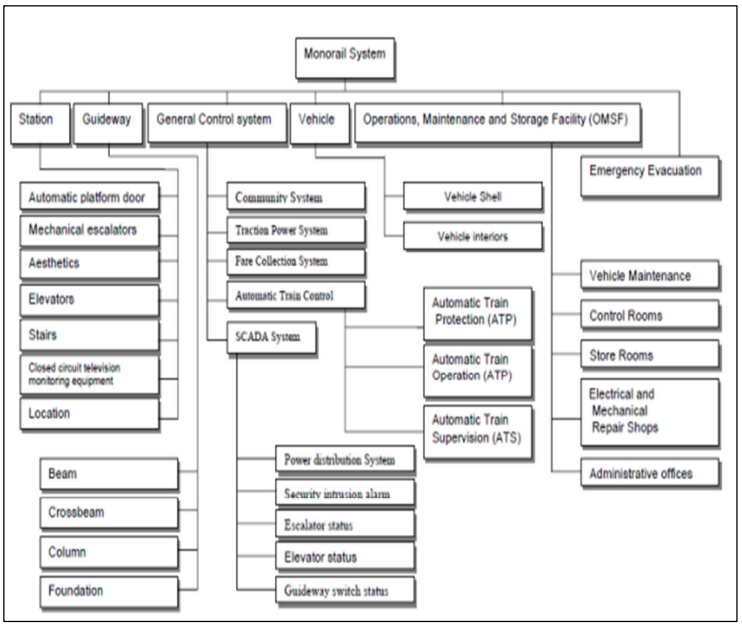

Fig. 2. Structure Diagram of Monorail System [7].

Kuala Lumpur Monorail was constructed in 1997, started with the construction of building facilities and runway depot building a monorail above ground (elevated) along the 8.6 km. Consisting of eleven station stops extending from the first station KL Sentral in Brickfields which is across the golden triangle and ends up Titi Wangsa is eleventh station in Jalan Tun Razak [8]. Project transportation spends of RM 1,180 million and started operating on August 31, 2003 by the KL Infrastructure Group Company which holds the concession for 40 years operating monorail from the royal government of Malaysia. On May 15, 2007 with the financial crisis in the company, KL Monorail was taken over by Syarikat Prasarana Negara Berhad (SPBN), a Government Company under the Ministry of Finance. And subsequent operation carried out by KL Star Rail Sdn Bhd. Table. 1 shows the results of a survey conducted in 2009 relating to the characteristics of Kuala Lumpur Monorail users.

Table 1. Kuala Lumpur Monorail User Characteristics.

Characteristics	Percentages
Nationality	Malaysian = 75.25 % , Others = 24.75 %
Gender	Male = 69.75%, Female = 30.25%
Age	1 - 25 years = 56.5%, 26 - 60 years = 43.35 % , ≥ 60 years = 0.25%
Education	PhD/Master/Degree/Diploma = 41.5% ,Others = 49.5%
Destinations	Work = 31%, Study = 11.75%, Shopping = 50.5%, Others = 6.75%
Occupation	Students = 45.25%, Official Government = 9.25%, Private= 45.5%
Monthly Income	≤ MYR1,000 = 41.25%, MYR1,000 – MYR5,000 = 47.25% ≥ MYR5,000 = 4.25%, Others = 7.25%
Frequency	One time = 50.75%, more than = 49.25%

Sources: 2009 Survey results

This study is part of a present monorail phenomenon. Many countries want to develop a modern monorail transport system as an alternative to solving the city's transportation problems, such as in Jakarta Indonesia, Mumbai India, Rzeszow Poland, Moscow, Calabar Nigeria, Jumeirah Dubai and others. This study aimed to determine the development of performance and user satisfaction of the operation of the Kuala Lumpur Monorail in Malaysia and gain input from care factors that still need to be improved.

2. Methodology

Many approaches to measuring satisfaction in the form of user behavior, including the method of Importance Performance Analysis (IPA), first introduced by Martilla and James in 1977 [9] to measure the relationship between consumer perceptions and priorities for improving the quality of products or services as well known as quadrant analysis [10, 11].

IPA has the main function to display information related to service factors which influence consumer satisfaction and loyalty, and service factors which consumers need to be increased due to the current conditions are not satisfactory.

IPA combines the measurement of factors of importance and satisfaction levels in two dimensional graphs that facilitate explanation of the data and get a

practical proposal. IPA chart interpretation or translation is very easy, where the IPA chart as in mathematical logic is divided into four quadrants based on importance performance measurement results, as shown in Fig. 3.

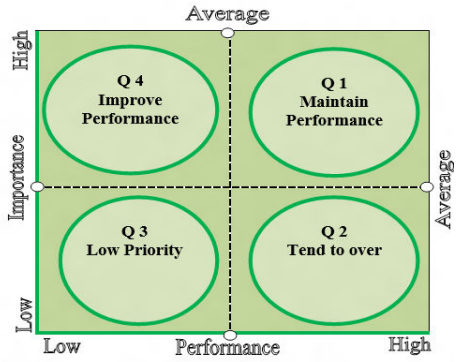

Fig. 3. Quadrant Map Importance Performance Analyses [12, 13].

Explanatory caption for each quadrant [10]:

- First quadrant, (high importance and high performance) maintain performance.

  The factors that lie in this quadrant are considered as factors contributing to customer satisfaction so that the management is obliged to ensure that the performance of its management institutions can continue to maintain the achievements that have been achieved;

- Second quadrant, (low importance and high performance) tends to over.

  The factors that lie in this quadrant are considered not very important so that the management needs to allocate resources associated with these factors to other factors that have a higher priority handling that still need improvement, such as the fourth quadrant;

- The third quadrant, (low importance and low performance) low priority.

  The factors that lie in this quadrant have a low level of satisfaction and well considered less important to consumers, so the management does not need to prioritize or less paying attention to these factors; and

- The fourth quadrant, (high importance and low performance) improve performance.

  The factors that lie in this quadrant are considered as very important factors to consumers but current conditions are not satisfactory, so the management is obliged to allocate adequate resources to improve the performance of these various factors. The factors that lie in this quadrant are a priority for improvement.

The following procedures relating to the use of methods of IPA:

- Determination of the factors to be analysed;
- Conduct a survey through questionnaires;
- Calculate the average level of satisfaction and priority handling;
- Create a graph IPA; and

- Conduct an evaluation of factors in accordance with their respective quadrants.

To determine the development of public transportation management system KL Monorail and measures the satisfaction of the users of the various factors relating to the operation of the KL Monorail in addition to observations and interviews with the management, who are competent in the field is also used questioner with the question format in accordance with needs and methods of IPA. Data collected through the deployment questioner to the 400 respondents obtained based on the results of sampling using a random sampling Taro Yamane, namely:

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

where: n = Number of samples
N = Number of population
d = Critical value (5%)

Implementation of the spread of the questionnaire on weekdays KL Monorail in Kuala Lumpur (Monday to Sunday) during peak hour time shows the station and routes then location of the distribution of respondents (Fig. 4). Preliminary investigation was conducted to evaluate the questionnaire and tested the validity and reliability to test whether each question valid and reliable. Testing was conducted using Excel and SPSS program Microsoft 13 in the following way:

a) Questions were grouped in a single factor. The questions on the test that is have a scale (scale 1: very dissatisfied, scale 2: not satisfied, scale 3: moderate, scale 4: satisfaction, scale 5: very satisfied).

b) Data was processed using the program Microsoft Excel and SPSS 13.

c) From the test results obtained, the validity and reliability of the test questions were checked.

d) The validity of the questionnaires can be seen from the corrected item-total correlation (*t* result) compared with (*t* table).

$$r = \frac{n(\sum XY) - (\sum X)(\sum Y)}{(n\sum X - (\sum X)^2).(n\sum Y^2 - (\sum Y)^2)} \tag{2}$$

$$t \text{ result} = \frac{r\sqrt{n-2}}{\sqrt{1-r^2}} \tag{3}$$

e) Basis for decision making to test the validity is *t result* >*t table*.

f) The reliability test can be seen from the value (*r* result) contained on the analysis results are then compared with (*r* table).

$$t \text{ result} = \frac{2rb}{1 + rb} \tag{4}$$

g) Basis for decision making to test the reliability is *r* result> *r* table.

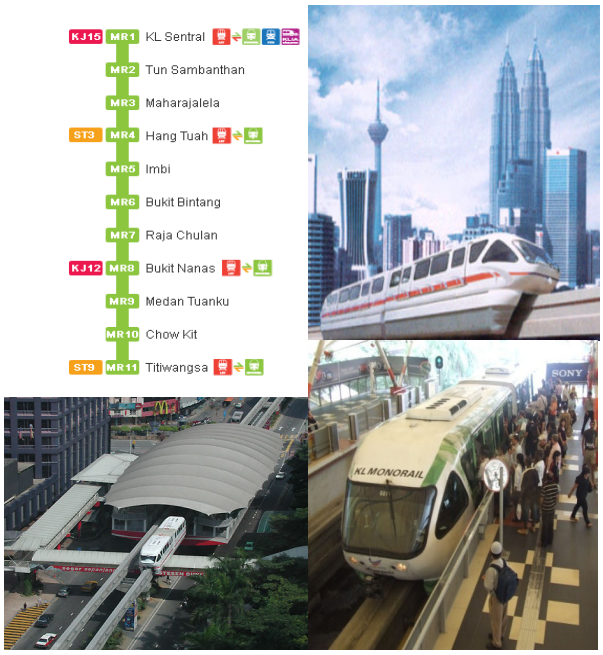

Fig. 4. Maps of Track Station and Coach Kuala Lumpur Monorail.

3. Results and Discussion

3.1. Development of user quantity KL monorail

From the observation of KL Monorail service to the services in 2012 is in Figs. 5 and 6. The existence percentage is increased in users from 2003 to 2012 average of 11.04% per year, which on average every working day using the KL monorail transport system are 66,765 passengers per day, for every hour an average of 3,709 passengers, for 18 hours of operation from 06:00 AM until 12:00 PM Malaysian time.

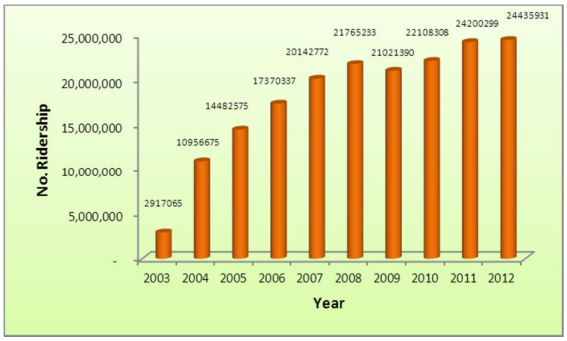

Fig. 5. The Increasing Number of Users of KL Monorail.

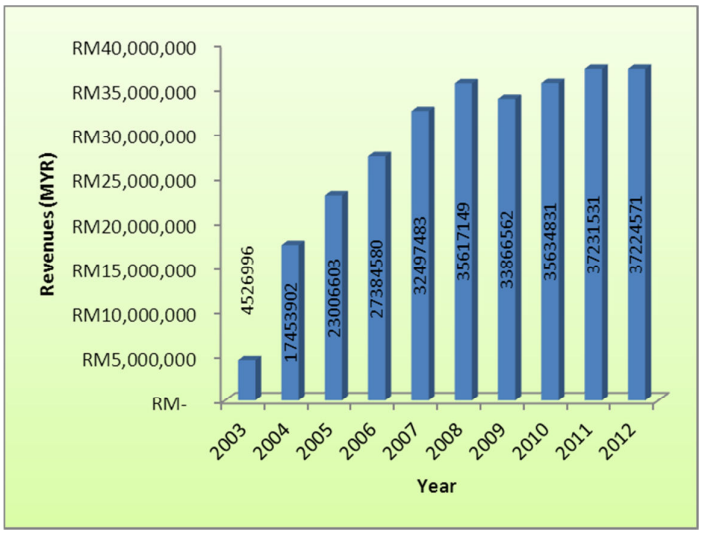

Fig. 6. The Increasing Number Revenues of KL Monorail.

Table 2 shows the origin-and-destination (OD) matrix of users commute using KL Monorail daily. Taken from daily number of passengers in August 2008 detected from 11 stations the highest OD value matrix is Bukit Bintang station and the low value of OD matrix is Tun Sambanthan station

Table 2. Average User OD Matrix KL Monorail August 2008.

O/D	KLS	TS	MAH	HT	IMB	BB	RC	BN	MT	CK	TIT	Total
KLS	32	42	206	794	3342	2731	994	241	201	670	739	9992
TS	29	4	27	97	130	150	109	31	13	28	25	643
MAH	197	36	10	191	318	356	152	116	39	87	51	1553
HT	664	125	173	45	968	1903	1398	297	101	208	42	5924
IMB	3422	166	318	968	86	421	414	699	318	862	833	8507
BB	2711	210	364	2204	447	83	370	1693	636	1651	1280	11649
RC	1035	134	148	1350	334	309	29	364	322	584	1014	5623
BN	241	32	107	309	679	1619	327	23	153	573	345	4408
MT	191	16	45	118	281	573	348	145	8	3969	131	5825
CK	691	29	83	216	796	1521	554	561	126	23	385	4985
TIT	610	24	42	52	759	1194	839	262	121	409	18	4330
Total	9823	818	1523	6344	8140	10860	5534	4432	2038	9064	4863	63439

O/D: Origin/Destination, RC: Raja Chulanstation, BN: Bukit Nanasstation,
KLS: KL Sentralstation, MT: Medan Tuankustation, CK: Chow Kitstation,
TIT: Titiwangsa station, TS: Tun Sambanthanstation, MAH: Maharajalela station,
HT: Hang Tuahstation, IMB: Imbistation, BB: Bukit Bintang Station.

3.2. Test validity and reliability

Validity and reliability of analysis results indicate that all items are tested. The questions presented in the questionnaires are valid and reliable, as shown in Table 3.

Table 3. Results of Test Validity and Reliability.

No.	Indicator	Correction value items Total correction	α
1	Environmental & cleanliness in station	0.8983	0.9461
2	Ticket counter	0.7492	0.8530
3	Reasonable ticket price	0.8246	0.8530
4	Waiting area & escalator down	0.6271	0.8530
5	Board information	0.8245	0.9004
6	Punctuality of train arrival	0.6362	0.8549
7	Seats provided in the train	0.9267	0.9605
8	Cleanliness in the train	0.6906	0.8549
9	Comfort when boarding train	0.7502	0.8549
10	Security, installation of CCTV	0.7272	0.8549
11	Additional coach and routes to other places	0.9267	0.9605
12	Parking & public transport at the surrounding area	0.7434	0.7972
13	Reduce traffic congestion & environmental friendly	0.7434	0.7972

3.3. Results of importance performance analysis (IPA)

Table 4 shows the results of the calculation of the average level of satisfaction and priority handling for each factor.

The results of the calculations in Table 4 later than 13 components that are associated with factors service KL Monorail service of public transportation, graphic images displayed in the form of IPA by using the average value of measurement results and the satisfaction level of management priorities interests (Fig. 7).

Table 4. Average Satisfaction and Handling Priority for Various Factors.

No.	Indicator	Average	
		Performance	Importance
1	Environmental & cleanliness in station	14.75	18.56
2	Ticket counter	14.88	18.58
3	Reasonable ticket price	14.14	17.02
4	Waiting area & escalator down	13.83	18.53
5	Board information	14.19	18.46
6	Punctuality of train arrival	14.38	18.58
7	Seats provided in the train	13.12	18.62
8	Cleanliness in the train	15.54	18.69
9	Comfort when boarding train	13.22	18.67
10	Security, installation of CCTV	14.06	18.50
11	Additional coach and routes to other places	11.42	18.52
12	Parking &Public transport at the surrounding area	13.30	18.51
13	Reduce traffic congestion & environmental friendly	15.71	18.67
	Average	14.04	18.45

In Fig. 7 the general quality of service is in conformity with consumer desires, but of the spread of the quadrant of the 13 factors related to the KL Monorail service to unknown what factors are actually still need to be improved or do not need to get attention. Based on the IPA chart in Fig. 7 the factors related to the KL Monorail service may be grouped in each quadrant as follows:

Quadrant 1: Maintain Performance (high importance and high performance).

Environmental and cleanliness in stations, ticket counter, board information, punctuality of train arrival, cleanliness in the train, security installation of CCTV, reduce traffic congestion and environmental friendly. Factors located in this quadrant are considered as an additional factor for the user satisfaction KL monorail system and consistent with the results of related studies. KL Starrail Sdn Bhd as the manager is obliged to maintain the achievements that have been achieved.

Quadrant 2: Tends to over (low importance & high performance).

Reasonable ticket price factor on offer from the analysis lies in this quadrant are considered satisfactory but not very important by the user so that the manager of KL Monorail does not need too much to allocate resources related to these factors, just enough to maintain and adapt to current conditions.

Quadrant 3: Low priority (low importance performance & low performance).

From the analysis in the third quadrant, no factor lies in this quadrant means no factor and low satisfaction levels are not important to the user KL monorail.

Quadrant 4: Improve performance (high importance and low performance).

Waiting area and escalator down, seats provided in the train, comport when boarding train, additional coach and routes other places, parking and public transport at the surrounding area. The factors that lie in this quadrant are considered as very important factors, but current conditions are not satisfactory for users KL Monorail especially at morning and evening peak hours when going to and from work, so the manager should seek adequate resources to improve performance on a variety of factors. The factors that lie in this quadrant are a priority to be improved so users can continue to maintain interest.

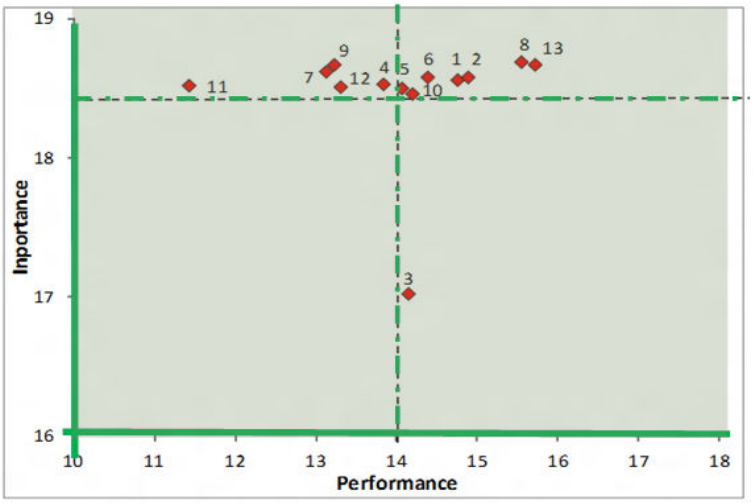

Fig. 7. Quadrant Importance Performance Analysis Based on the Average Value Calculation Results.

4. Conclusions

As a conclusion, KL Monorail transport system is one of the public transport is very important and impressive for the community and tourists at home and abroad. This system greatly assists communities in implementing activities in Kuala Lumpur. KL monorail type Alweg straddle-beam (have two car- train),in the last eight years (2003-2012) has increased by 11.04% passengers per year, by 2012 the total number passengers 24,435,931 people with an average 66,765 passengers per day.

In general, users of public transportation system KL Monorail is quite satisfied with the condition and quality of service at this time. But if the manager wants to increase the attractiveness and the quantity of users or increase profits, it needs to be pursued some of the following; Improve service waiting area and additional escalator down, improve the quality and quantity seats in the train, additional coach and routes to other places, the convenience of parking and public transportation to the surrounding areas, improve comfort when boarding train especially at busy times. Then also must conduct a campaign by highlighting the advantages KL Monorail in comparison with other transportation.

This study is very importance because the public transportation that use monorail systems in the South East Asian Country (ASEAN), only in Kuala Lumpur Malaysia and Singapore. Should maintain and raise their services in order to make samples studies and pilot projects for development in the city or other countries. Particularly to address issues related to congestion, pollution and environmental friendly city toward Green Transportation.

Acknowledgment

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