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Research paper

Effectiveness of Commuter Rail Service Toward Passenger's Satisfaction: a Case Study from Kuala Lumpur, Malaysia

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Abstract

This paper's main objective is to evaluate the quality of commuter rail service at Kuala Lumpur by conduction a commuter user survey. The study sample consisted of 400 commuter rail passengers. The results reveal that there is significant conflict between passenger's expectation and perception of the commuter rail service quality at Kuala Lumpur. Measured value for passenger expectation are found to be consistently higher than their satisfaction, which indicate that is room for Malayan Railways Limited (KTMB) management to improve its service quality. Three out of 12 service items such as the price of ticket, the punctuality time for departure and arrival of train, and ticket counter rated as important and satisfactory, and thus should be maintained. These items are the issues that may have caused concerns for passengers and should urgently addressed by KTMB management to improve passenger's satisfaction as well as to increase the commuter rail ridership.

Keywords: *Importance-performance analysis (IPA); passenger satisfaction; passenger perception; commuter rail; quality of service.*

1. Introduction

Nowadays, public transport plays a significant role as a medium of transportation especially in urban settings. There are several types of public transport worldwide, namely; bus, taxi, light rail transit (LRT), monorail, commuter rail, tram, subway, mass rapid transit (MRT) etc. Public transport provides a convenient, cheap and fast mobility service to serve the society [1]. According to [2], the service that provide by public transport was found affordable and high reliable due to long term experience over decades. Public transport also one of the solutions to reduce traffic congestion, air pollution, limited parking problem as highlighted by [1] and [3]. In other word, public transport can contribute to the three domains of sustainable development, namely; environmental, economic and social [4].

In many developed countries, like in European countries, society are willing to use public transport compared to private vehicle due to the advancement of their public transportation system. The public transportation system in developed countries are reliable and extensive. [5] also highlighted that the public transport user in developed countries have flexibility to change their travel schedule including mode and route if they are dissatisfied with the service provided. Unlike in developed countries, people in developing countries, such as Malaysia, less interest to use public transport because according to [6], public transport in developing countries provide an almost lower reliability and service quality and loose regulation due to dependent on paratransit system. This low reliability and service quality conditions enhance the feeling of ambiguity among users and encourage them to shift to more reliable and accessible modes of transportation (e.g. motorcycle), whenever possible.

Generally, the definition of service quality is the overall assessment by customer toward service provider's performance [7]. Additionally, according to [8], service quality is a measure of how well the service level that provided matches consumer needs. Thus, the public transport service quality reflects the overall satisfaction of public transport users respecting the overall service provided by public transport authority. Satisfaction refers to overall evaluation of service by customer in terms of whether that service met or exceed their expectation or not [9]. Providing a good/high quality of public transportation service; or other words, the service that meet passenger's expectation and travel needs is important in creating an attractive and inclusive urban transport system. Furthermore, it is crucial to public transport authority to recognize the service quality measurement that consequence for the passengers nowadays. Thus, in recent years, the issues of public transport service quality have been widely assessed by an experts or researchers in public transport literature. For example, [10] explored the user's perception of public transport service quality by qualitative method. [3] assessed the drivers of user's satisfaction with public transport service. Besides, [11] also focused on identification of the most significant elements of travel satisfaction with public transport service for overall segment of travelers. Additionally, [8], [12] and [13] focused on service quality of public transport in their studies. The aim of these studies is to provide 'hint' or evidence to improve public transport user's satisfaction and making the service more user-oriented.

Thus, over the last few decades, researchers and experts has conducted numbers of studies to gain attention by society to use public transport. For example, [10], [14], [15], [16], [17] and [18]. However, a study by [19] found that the best strategy to attract society using

public transport (e.g. bus transit) is enhance the service quality of the public transport. [20] also argue that quality of service is an important performance indicator and should be treated importantly as the level of profitability.
In this line, this current research was conducted to identify an important element requiring investment and focus of resources to improve quality service that fulfil the need and expectation of commuter rail users in Kuala Lumpur, Malaysia. In addition, Kuala Lumpur is a large and modern metropolitan city that occupied by 7.2 million of population who depends on the effectiveness of the public transport to bring them to any destination [1], [6]. According to [21], the public transportation system is a part of the basic infrastructure that is essential and important in the development of a country. The commuter rail (KTMB) is a part of rail-based public transport in Kuala Lumpur. The rail-based public transport in Kuala Lumpur consists of two lines of light rail transit (LRT), monorail, and express rail link (ERL), as displayed in Figure 1. Commuter rail started its operation since August 1995, and strives to solve problem of traffic congestion, reduce air pollution, environmentally friendly, save time and cost. However, Commuter rail's service often face a lot of complaints from consumers regarding the quality of service, for example the punctuality of commuter rail's arrival, ticketing systems, cleanliness aspects and so on. Expectations from them are important and can be defined as the assumptions made by the consumers that might happen during an imminent transaction [22], [23]. Customer's satisfaction has become a key intermediary objective in the service operations as it indicates organizational performance [24].
After this introduction, this paper is organized as follows: The methodology part presents the questionnaire design, data collection and the 'mean and GAP' and IPA methodologies; the result and discussion section describe the respondent characteristics, and other result that obtained from these analyses; and finally, the last section is the main conclusion of this study.

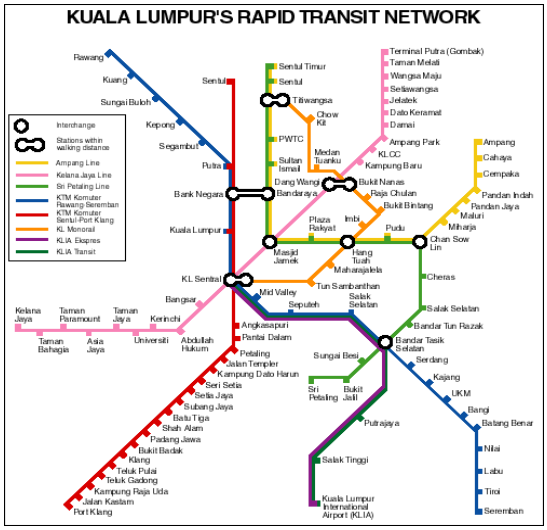

Fig. 1: Kuala Lumpur's Rapid Transit Network

2. Methodology

With the development of the rail-based public transportation especially commuter rail improved the public transport service in Kuala Lumpur. People are less dependent to private cars and motorcycles. However, the main problem is how to make sure society frequently use the commuter train. To promote society to consistently use the commuter rail, the KTMB authority should concern about their service quality. Thus, this current study is to assess the passenger satisfaction towards commuter rail service at Kuala Lumpur. [25] on their proposed service quality gap model suggested that service quality form the distinctness between expectation and performance along quality's dimension. The difference between passenger's expectations and perceptions is one of the proposed gaps.
The selection of service items is important for commuter rail service quality gap assessment. The design of questionnaire in this current study was adopted by [1]. Twenty pilot questionnaires were handed out with randomly selected passengers at UKM station to ensure that all questions given in the questionnaire could be well understood by the passengers. This survey questionnaire consists of three segments: demographic, travel information and commuter train service items. The first segment is about respondent's socio-demographic information including gender, age, race, education and income. The second segment of the questionnaire consists of passenger's travel information such as purpose of travel and travel frequency. Finally, the third segment was composed of 12 service items as listed in Table 2. In the third segment, respondents were asked to indicate the level of satisfaction of "expectation" and "perception" separately due to their experience after using commuter train. Each item is measured using a five-point-likert scale, using the key "strongly dissatisfied (=1)", "dissatisfied (=2)", "neutral (=3)", "satisfied (=4)" and "strongly satisfied (=5)".
The target respondents for this study is passengers who travelled using commuter rail. Data for empirical analysis in this study was collected using the self-administered questionnaire. The 520 questionnaires randomly distributed based on a convenience sampling technique with the help of two research assistants at four main commuter rail station (e.g. Mid Valley station, KL central station, South Lake City station and UKM station) from 10 to 25 March 2017. Before starting the survey, the research assistant will explain about the purpose of the survey to the targeted respondent and asked for their willingness to participate this survey. Only those who were willing to take part in this survey answered the questionnaire. In total, 400 questionnaires were verified as useful for further analysis, yielding an effective response rate of 77%.
The data analysis was conducted in two stages. First, mean and GAP analysis (statistical analysis) was performed using Microsoft Excel and SPSS to assess the gap of passenger's need and their satisfaction of commuter rail's service quality. The Important Performance Analysis (IPA) that formulated by [26] was used in this study to measure the effectiveness and passenger's satisfaction towards service quality of commuter rail in Kuala Lumpur. IPA has the main function to display information relating to the factors that affect the service satisfaction and loyalty, as well as factors of services need to be improved. Through this method, respondents were asked to rate the level of importance and satisfaction, then the value of the degree of importance and satisfaction are analysed in Importance-Performance Chart. The x-axis represents the level of satisfaction while the y-axis represents the level of interests (see Figure 2). IPA chart consists of four quadrants. Each quadrant has different elements and it is based on interest-performance measurement results, as shown in Figure 2. The

IPA analysis can provide KTMB management (commuter rail authority) with useful guidance in allocating efficient and appropriate resources to satisfy the desires and needs of commuter rail passengers.

Fig. 2: The original partition of the IPA grid in areas with distinct implications for product or service development (adapted from [26]).

Explanatory sentences for each quadrant [1];

I. "Keep up the good work" (high importance & high performance)
The factors that lie in this quadrant are considered as the supporting factors to passenger's satisfaction, so the management of the service should ensure that the performance that has been achieved will be maintained.

II. "Concentrate here" (high importance & low performance)
The factors that lie in this quadrant are considered as very important factors to passengers, but the current conditions are not satisfactory, so the management of the service need to allocate resources to improve its performance. The factors in this quadrant are the priority for improvement and enhancement.

III. "Low Priority" (low importance & low performance)
The factors that lie in this quadrant have a low level of satisfaction but are considered not too important to passengers. The management of the service does not need to give fully priority to these factors.

IV. "Possible overkill" (low importance & high performance)
The factors that lie in this quadrant are considered no too important compared to other factors, so the management of the service should allocate resources related with these factors to other factors that have a higher priority to be handled, and still need improvement

3. Result and discussion

3.1. Respondent characteristics

A total of 400 valid responses were collected in this study. The summary statistics of socio-demographic characteristics and travel information of passengers are presented in Table 1. About 57.5% of total respondents were female whilst the male's respondent is about 42.5%. Among our sample, female was dominant the total number of respondents. Passenger's aged below than 25 and 25-40 account for the majority of sample. Regarding education level, over half of the passengers possessed a bachelor degree and other higher qualification (Post graduate degree or higher) with 42% and 9% respectively. In addition, the largest proportion of respondent's monthly income fell within the group of "less than MYR1000" (37.8%), the lowest passenger's monthly income class examined.

Table 1: Respondent's demographic characteristics (N = 400)

	Frequency	Percent (%)
Gender		
Male	170	42.5
Female	230	57.5
Total	**400**	**100**
Age Group		
Less than 25	189	47.3
26-40	164	41.0
41-60	43	10.8
Over 60	4	1.0
Total	**400**	**100**
Education		
Higher school or lower	53	13.3
Diploma	138	34.5
Bachelor degree	168	42.0
Post graduate degree or higher	36	9.0
Other	5	1.3
Total	**400**	**100**
Monthly income (MYR)*		
Less than 1000	151	37.8
1001-2000	85	21.3
2001-3000	110	27.5
Over 3000	54	13.5
Total	**400**	**100**
Purpose of travel		
Working	169	42.3

Study	75	18.8
Shopping	64	16.0
Others	92	23.0
Total	**400**	**100**
Travel frequency in a week		
One day	76	19.0
Weekends	148	37.0
5 days (weekdays)	105	26.3
Every day (Monday-Sunday)	71	17.8
Total	**400**	**100**

**1 MYR = 0.26 USD*

3.2. Mean and GAP analysis

Table 2 reports the statistical analysis result (mean and standard deviation) of the passenger's expectation and perception scores for the 12 items as listed in the same table. Based on a paired t-test, there are significant differences ($p < 0.001$) between expectation and perception scores for all items.

As shown in Table 2, the numbers in parentheses represents the ranks of the service items. This study found that the passengers put highest expectation on item 3 ("Reasonable ticket price") and item 6 ("Commuter train departure and arrival time punctuality"), followed by item 2 ("Ticket counter"), item 7 ("Cleanness and comfort in the commuter"), item 8 ("Seating in the commuter") and item 12 ("Reduce traffic congestion and environmental friendly"). These items shared the second highest expectation level from passengers. Despite the cost and time consuming, commuter rail passengers also put high expectation on the safety factor. Result on table 2 reported that commuter rail passengers put higher expectation (rank 3) on item 9 ("CCTV and security control"). This outcome reveals that passengers also concern about their safety. According to [1] and [27], the safety factor is a major indicator of user satisfaction towards public transport outside of European countries. This is match to the study by [28] that noticed the user's perception on safety are also correlate to the overall satisfaction. In this context, safety issue can relate to safety from crime [29] and traffic [30].

Regarding passenger's perception on quality of commuter rail's service at Kuala Lumpur, results showed that item 12 ("Reduce traffic congestion and environmental friendly"), item 9 ("CCTV and Security control") and item 7 ("Cleanness and comfort in the commuter") placed on the top 3 of the perception's ranking as shown in Table 2. These results indicate that the passengers feel satisfied with the quality of service provided by KTMB management based on those items (item 12, 9 and 7). Based on result as reported in Table 2, most of commuter rail users did not satisfied with the ticket price (item 3).

Additionally, Table 2 presents the gap between the passenger's perception and passenger's expectation. As reported in Table 2, the scores for all passenger's expectation are significantly higher than the passenger's perception scores. The four items presenting the biggest gap are: item 3 ("Reasonable ticket price"), item 6 ("Punctuality of commuter departure and arrival"), item 2 ("Ticket counter") and item 10 ("Parking area"). These significant differences between expectation scores and perception scores proved that the commuter users could have felt most frustrated by these services.

The outcome of this study is in line with [31] and [32], who is mentioned that the cost of using public transport is a key factor to influence the user's satisfaction towards public transport system. [3], [33] and [34] also mentioned that the passenger's perception on the cost related with public transport service is related to their satisfaction. The cost or ticket price factor is the most concerned factor in this study could be due to the majority (37.8%) of commuter rail passengers from a lower average household monthly income (less than RM1000), thus the commuter rail user felt travel cost burden for the current ticket price.

In the context of the punctuality of the commuter rail's departure and arrival time, [3], [35] and [34] highlighted that the user who are satisfied with the on-time performance of the public transport service are very likely satisfied with the overall service provided. In many developed countries, the number of public transport ridership higher compare to the other countries in the world is because of the public transport service is very punctual.

The third item that respondents felt frustrated by the service of commuter rail during this study was conducted is the ticket counter. They experienced the slow service during purchasing ticket at the counter. This factor also one of the factors that contribute to the dissatisfaction of public transport user and this outcome is in line with the study by [31]. On the other hand, parking area also one of the factors that contributed to the frustration to commuter rail passengers in Kuala Lumpur. The limited parking space due to rapidly development of Kuala Lumpur, especially near to KTMB commuter station area is the main reason to this phenomenon.

Table 2: The difference between passenger's expectation and perception for commuter service items.

No	Item	Expectation (E)		Perception (P)		Gap (mean)
		Mean	SD	Mean	SD	P-E
1	Environmental and cleanliness in station	4.69 (4)	0.499	3.49 (8)	0.762	-1.20
2	Ticket counter	4.71 (2)	0.490	3.43 (9)	0.772	-1.28
3	Reasonable ticket price	4.83 (1)	0.428	2.64 (12)	0.907	-2.19
4	Waiting area	4.62 (7)	0.521	3.55 (7)	0.748	-1.07
5	Digital travel information screen	4.63 (6)	0.537	3.61 (4)	0.762	-1.02
6	Punctuality of commuter departure and arrival	4.83 (1)	0.406	2.68 (11)	0.948	-2.15
7	Cleanness and comfort in the commuter	4.71 (2)	0.487	3.71 (3)	0.736	-1.00
8	Seating in the commuter	4.71 (2)	0.472	3.58 (6)	0.735	-1.13
9	CCTV and Security control	4.70 (3)	0.493	3.74 (2)	0.734	-0.96
10	Parking area	4.58 (8)	0.570	3.35 (10)	0.823	-1.23
11	Courtesy and helpfulness of staff in ticket counter	4.65 (5)	0.512	3.60 (5)	0.708	-1.05
12	Reduce traffic congestion and environmentally friendly	4.71 (2)	0.457	3.85 (1)	0.740	-0.86

3.3. IPA analysis

An IPA analysis of the commuter rail system in Kuala Lumpur allowed us to prioritize various action to improve the quality of the commuter rail service, as well as to increase the passenger's satisfaction and passenger's loyalty. Figure 3 summarised the relative positions of 12 attributes in matrix format, with measured "performance" values on horizontal axis and measured "important" values on vertical

axis. The IPA model showed the items investigated in this study are grouped into four quadrants as illustrated in Figure 1; namely quadrant I ("keep up the good work"), quadrant II ("concentrate here"), quadrant III ("low priority") and quadrant IV ("possible overkill").
As reported in Figure 3, all the survey question items fell in all quadrant. It is interesting noting that the three attributes such as item 7 ("Cleanness and comfort in the commuter"), item 8 ("Seating in the commuter") and item 12 ("Reduce traffic congestion and environmental friendly") can be a "keep up the good work" factor because all these factors showed the best level of perceived quality and important on user satisfaction. This finding is consistent with the findings of a previous research [36] highlighted that the problem of transportation congestion in cities can be further relieved by constructing and perfecting urban rail transit network. This study showed that the performance of these items should be maintained by the commuter rail operators and the administration.

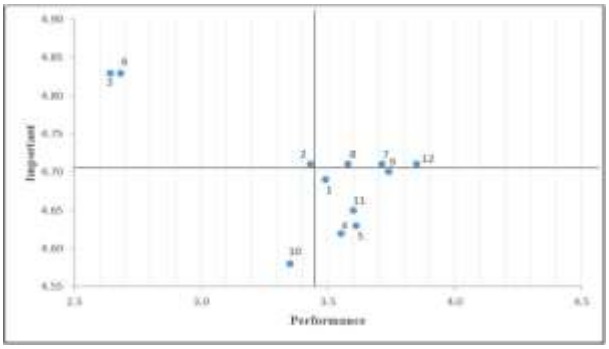

Fig. 3: Important Performance Analysis

*Note: Number of items refer to Table 2.

Three services such as ticket counter, reasonable ticket price and punctuality of commuter rail departure and arrival required high priority improvement action by the commuter rail management. These three attributes were classified as 'concentrate here" factor. This result showed that the commuter rail passengers felt relatively low satisfaction level regarding the process of purchasing ticket at the counter, the cost of travel using commuter rail and the punctuality of the departure and arrival of commuter rail. The commuter rail operator and administration should take improvement action to improve the service quality of commuter rail in Kuala Lumpur. Thus, it will enhance the commuter rail passenger satisfaction as well as their loyalty towards commuter rail. This is in line with [37] who mentioned that the items fell in quadrant II should be improved first. The finding is also supported by a research by [38] which investigates the effective public transport in Oman indicate that a strong need for offering frequent, widely available, and well-connected public transport services which are attractive from convenience, reliability, safety, and socio-cultural perspectives.
Several possible actions are needed to improve the passenger's satisfaction after use the commuter rail and to gain their loyalty. For the case of counter ticket, the management of commuter rail should provide an alternative way to purchase the ticket instead of purchase direct at the counter. The strategies are promoting purchase online, seasonal (day, week, or month) ticket, and provide more ticket vending location [1], [35]. Moreover, the comfort of the ticket counter also needs to consider by service provider. These strategies can improve the effectiveness and reduce the delay during purchasing the commuter rail ticket, which lead to improve the quality of service and at the same time can promote society use commuter rail.
For the fare price factor, many studies were conducted to investigate the relationship between travel by public transport cost and passenger's satisfaction [3], [27], [33], [34], [39]. According to [34], and [27], the commuter rail operator should offer a variety of tickets with different price structures to reflect the need of passengers such as student and senior citizen passes, and day, week, and month passes. Additionally, the other actions to improve the commuter rail passenger's satisfaction in term of travel cost are reduce ticket price, promoting transferable ticket, and introduce the period of free public transport face [32], [40].
In the context of punctuality, the commuter rail service provider should give more attention to this factor because the previous literature showed that the improvement the punctuality of commuter train service, lead to increase the user's satisfaction, as well as increase the number of ridership [41]. Thus, this indirectly will reduce the traffic congestion [42].
Figure 3 displayed the parking area was also considered to be a factor that influence the commuter train user's satisfaction, but with a lower level of priority. Furthermore, the environmental and cleanliness in station, waiting area, digital travel information screen, CCTV and security control and courtesy and helpfulness of staff in ticket counter showed the higher level of service quality but these items were "possible overkill" factor (less important in their overall user satisfaction). The commuter rail management are no need to allocate resources too much regarding these items but need to maintain and adapt to current situation.

4. Conclusion

The quality of commuter rail service in Kuala Lumpur has been successful assessed in this study through conducting a commuter rail's passenger's satisfaction survey. This exploratory research highlighted in this paper offers several opinion and suggestion regarding commuter rail passenger's perception and satisfaction of service quality. This study shows that passenger's expectation scores is significantly higher than their perception scores for all investigated items, which indicate that there is room for commuter rail management or other authority especially in Kuala Lumpur to improve their quality of service. Passengers put their high expectation on reasonable price ticket and the punctuality of commuter train depart and arrive. However, the passengers felt very not satisfied to these items on their actual performance due to the largest service quality gap. Additionally, passengers were most satisfied with the use of commuter rail can reduce traffic congestion and very environmental friendly (item 12).
IPA model that applied in this study suggests that three of the twelve (12) service items were should be maintained ("keep up the good work") because these items were rated as important and satisfactory. Furthermore, five items were rated lower important level but have received almost higher performance scores. These items were tended to over ("possible overkill"). Specifically, this study also revealed that three areas such as ticket counter, ticket price and commuter rail punctuality received relatively lower performance score by passengers although these items are important. Commuter rail management should give priority and struggle to improve its service in these areas. With the deregulation and privatization of commuter train service in Malaysia and other countries around the world, commuter rail service quality, along with efficiency and profitability should gain more attention as a source of research, instead of being an issue re-

garding only regulators and commuter rail operators. Perhaps, with the improvement of quality service of commuter rail and other mode of public transportation can promote the society to use public transport and reduce traffic congestion, as well as reduce pollutions (e.g. air and sound pollution).

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