Rail Transport Service Performance Indicators in Klang Valley

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Abstract. Rail Transport is one of the alternative modes of transport that has become a priority for developing countries to promote environmental, economic and social well-being in upgrading the quality of urban life. As such, the study on electric rail transportation is important to provide high quality service in order to increase the number of users. This study focused on KTM (Keretapi Tanah Melayu) train commuter known as KTM Komuter and LRT (Light Rail Transit) in the Klang Valley in order to determine service performance indicator provided by both rail operators. The TRANSQUAL Model was used as an instrument to measure the performance of rail transportation. A total of 110 questionnaires was distributed to each rail users KTM and LRT at rail stations. Descriptive analysis and factor analysis were used in the interpretation of data. The findings revealed that the service quality indicators for KTM had been classified into five factors such as environment, safety and security, relibility, responsiveness and physical facilities. While, for LRT environment, physical facilities, accessibility, reliability, safety and security. Thus, these factors can be used to measure the level of service performance provided and gaining the attractiveness of public transportation systems towards sustainability.

Keywords: Electric train, Public transportation, Users' satisfaction, TRANSQUAL model, Service performance indicators.

INTRODUCTION

There are various ways to reduce the impact of energy deficiency and environmental issues such as global warming and climate change. One of the actions in reducing environmental pollution and energy deficiency is by promoting public transport. Chaturvedi and Kim, 2014 [1] claimed that public transportation is an alternative strategy to cater to the transportation demands of developing countries in a sustainable and energy efficient way. As a developing country, Malaysia is attempting to improve the urban public transportation in order to alleviate these problems. Public transport operators need to cooperate with government agencies to ensure the sustainability of the public transportation system.

In order to cut emissions and reduce energy use that contribute to environmental problem, people need to basically alter their fossil-fuel demanding transportation systems [2]. With this indication, it was distinguished that supporting Electric Multiple Unit (EMU) train such as KTM Komuter and LRT will significantly contribute in the decrease of transport emissions in Malaysia. As such, the evolution of public transport from bus based public transport to rail based public transport system had been implemented. Unfortunately, most of the public transportation systems in the areas of Klang Valley, especially the KTM Komuter lack of service quality desired by

users [3]. Therefore, this study is to determine the user perception of service quality of both KTM Komuter and LRT to identify the characteristics of service performance provided by them in the Klang Valley. The attributes indicate the feature of service quality of the study area.

LITERATURE REVIEW

Previous studies have shown that there are some similarity in terms of parameters, hypothesized used and method of data analysis. The parameter used to measure the users' perception is quite similar among the researchers. Most of the researchers that studied the service quality used the SERVQUAL model to determine the users' expectation. The SERVQUAL Model introduced by Parasuraman et al., 1985 [4], has become the pioneer model for service quality evaluation. Previous researchers have adapted that model according to variation of industries according to their study. Public transport research also has an adaptation model from the SERVQUAL Model. A new dimension named as TRANSQUAL Model developed by Haron et al., 2015 [5] used to measure service performance index for urban public transport. She established 10 sets of factors which are accessibility, reliability, responsiveness, understanding, physical facilities, safety and security, environment, image, time and fare. This model is most applicable to determine the urban public transport service quality in Malaysia. Then, as stated by Yaakub and Napiah, 2011 [6], in order to determine the pleasant appearance of service in terms of availability, comfort and convenience, it is required to assess the users' perception on the public transport service. This model used both qualitative and quantitative measurement of service quality factor through logical technique.

Performance in general refers to any assessment or evaluation measure. A performance indicator is specifically defined as evaluations used towards the performance goal and monitor the performance. Then, as presented by Transportation Research Board, 2003 [7], transport performance is quantitative or qualitative factors used to evaluate certain characteristics of a transportation service. The indicator used generally related to the quality of service. This can be proven by the stated previous study [8-10] that classified the performance indicator in different categories. Thus, latest study by Haron et al., 2015 [5], applied multi-method that emphasis on the users' satisfaction. In addition, the methods used for data analysis are also similar among researchers who are used different test such as logistic regression, factor analysis, sructural equation modeling (SEM).

METHOD

A structured questionnaire from the TRANSQUAL Model was adopted in this study and consisted of three sections which are demographic profile, rail transport characteristics and lastly the users' perception towards various dimension of services that have been provided. Nine factors were chosen such as accessibility, reliability, responsiveness, physical facilities, safety and security, understanding, environment, time and fare. The questionnaires used to collect primary data while interviews were also conducted with the train operators and users. Pictures were also taken in dissimilar condition as empirical evidence.

There are two different routes that have been chosen for this study in order to make the comparison in terms of service performance which are frequency, time travel and capacity between KTM and LRT. The KTM chosen route is the Port Klang Line (Line 2) while for LRT, is the Kelana Jaya Line (Line 5). The targeted respondents in this study were among the users at each station along the routes. Quantitative and qualitative surveys were implemented in the data collection. Questionnaires and interviews were carried out in order to determine users' perception regarding rail transport in Klang Valley. Observations were conducted throughout the visit at every halt. From the observations, train characteristics, halt, facilities, ticketing system, capacity, fares and frequency were determined.

Survey and Observation

An observation was done on service condition such as physical facilities offered by rail transport management in Malaysia. The services provided by rail transport operators are essential in order to satisfy the users. From the observation, all terminals and halts provided stairs, escalators, accessible lifts, stairs handrails, priority lanes, wide gate and slip resistant floor for the convenience of all the passengers. The design and condition of the KTM and LRT were also observed in determining the performance provided. Seats along the lay bay area are not enough for the waiting users, especially for KTM users. The design of the seats can be considered as a convenience for the passengers' comfort. However, the condition at KTM lay bay area is unsafe because of the insufficient illumination

at night. Passenger seats in the KTM are more comfortable than the ones in the LRT. The seat design for disabled people is also provided. The space inside the KTM and LRT are adequate for passenger to enter and exit.

The demographic characteristics of the respondents as a whole shows women dominated by 70.0% compared to male (30.0%). Most respondents were aged between 18 to 29 years old and do not have any income (53.2%). Both of the users from the private sector and students are represented by more than 30.0% respectively. Based on the data collected, out of the total respondents, 73.0% of them have a driving license.

ANALYSIS AND RESULTS

In this analysis, the service performance of rail transport in the Klang Valley was determined by users' experience. The respondents were asked to rate the average of KTM and LRT characteristics at the same time, chosen the convenient criteria suggested in the structured questionnaires. The comparison of item "how do you arrive at the first bus stop" between KTM and LRT were quite different. LRT shows a higher percentage by walking, 46.0%, while KTM recorded the highest percentage to arrive at the first stop by bus which is 40%. The differences between both modes are because of the access to the LRT stations is closer to the residential area compared to the KTM stations.

It was found that "distance to the first stop" for KTM and LRT of 10 to 50 meters were recorded as the highest percentage among other criteria which is 35.0% and 36.0% respectively. This condition is likely due to the distance of bus stop which is located nearer to the residential area. Meanwhile, the distance of more than 400 meters recorded 26.7% for KTM and 22.0% for LRT. There were 63.3% of KTM respondents who spent more than 10 minutes of waiting time. This shows the unreliable waiting time for its service. Through the interviews from the users, mostly of them are not satisfied as they have to wait for a long time. From the observation, if there is a delay of travel, KTM operator will announce and display it on the boarding screen which is located at the lay bay area.

Meanwhile, the waiting time for the LRT is deemed more reliable compared to KTM as 50% of the respondents only needed to wait for about 1 to 3 minutes. This condition is likely due to the respondents' boarding time which is convenient to their arrival time at the stations. More than 60.0% of the respondents do not know the KTM and LRT schedule From the observation, there is no schedule provided at the stations. The schedule is really important for users to estimate the travelling time from one destination to another.

Analysis of "frequency" less than 5 minutes for LRT revealed 70.0% as the highest percentage of time and corresponded to the frequency provided. However, KTM shows that 50.0% of the frequency is more than 15 minutes, indicate a quite longer waiting time compared to LRT. Meanwhile, the "distance to destination" of KTM shows that 45.0% respondents travel for more than 15 km, followed by 25.0% at a range of 6 to10 km and 15.0% for both ranges that travel less than 5 km. The distance to the destination is corresponding to the waiting time. The higher the distance to the destination, the longer waiting time for other users. This situation is differs compared to LRT whereas, it is recorded that 34.0% of respondents travel at the range of 6 to 10 km and recorded as the highest percentage among both.

About 60.0% of KTM respondents travel more than 15 minutes while the "travel time" for LRT shows 30.0% of respondents travel for less than 10 minutes. The longer the "distance travel to the destination", the longer the "travel time" required. However, 38.4% of KTM respondents need to change the transportation mode once and 30.0% do not require any change in the mode of transport to reach their destination. Unfortunately, 31.7% of them require two and three times of interchanges. Fortunately, 70.0% of the LRT respondents do not require changing the mode of transport. This is because the LRT line facilitates more nearer to the main destination.

Data Reduction and Analysis

Several steps need to be considered in carrying out data analysis. In the first step, the reliability of data in this study was determined using the Cronbach's Alpha approach. After going through validity test, the next step is continue with factor analysis. The third step is the item filtration and during the process the factor were reorganised and reconstructed until the factor was neutralised. In the process the items with low factor loading were removed and after a few filteration the item were rearrange into several factor based on dimension or term accordingly. At the end, several high consistency factor based data generation on factor loading can be identify and a set of performance indicator will obtained [5].

From the reliability analysis, initial test for both rail score the high value of Cronbach's Alpha, as KTM is 0.937 while LRT is 0.957. Whereas, the results of final test also high for both rail as shown in **TABLE 1**. This means that the correlation between the items is good and acceptable to be continue with factor analysis in this study [12].

Table 1. Initial and Final Test for Scale of Reliability Cronbach's Alpha

		Reliability Statistic		Scale Statistic		
		Cronbach's Alpha	N of items	Mean	Variance	Standard Deviation
Initial	**KTM**	0.937	29	100.40	349.193	18.687
	LRT	0.957	29	115.66	273.617	16.541
Final	**KTM**	0.921	23	83.05	234.451	15.367
	LRT	0.938	24	96.17	259.863	16.652

Subsequently, the validity of data were tested using the Kaiser-Meyer-Olkin (KMO) and Bartlett's Test. The KMO Test helps researchers identify whether items used are suitable to conduct the factor analysis. If the same correlation exists between two or more items, the items will measuring the same aspect. This is because KMO test shows the multicollinearity [12]. It's found that the measure of sample adequacy (KMO) for KTM and LRT is 0.776 and 0.803 respectively, which is more than 0.5. In this case, KMO value shows that the data does not have multicollinearity problem, so that these items are suitable for factor analysis [13]. Similarly, Bartlett's Test of Sphericity values is significant ($p < 0.05$), suggested that items are closely related to each other and suitable for analysis factor. Bartlett's Test of Sphericity is used to determine whether correlations between items are significant before carrying on to factor analysis. The result is tabulated in **TABLE 2**.

Table 2. Kaiser-Meyer-Olkin (KMO) and Bartlett's Test

Rail Transport		**KTM**	**LRT**
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		0.776	0.803
Bartlett's Test of Sphericity	Approx. Chi-Square	1365.697	1078.666
	df	276	231
	Sig.	0.000	0.000

The final of 5 factors for both KTM and LRT were obtained. From the total of 29 items, reduced to 24 items for KTM and 21 items for LRT. The other items were removed after the process of elimination and neutralisation items after several times until finally, there was no item being removed. All these 5 factors contribute to more than 70.0% to the changes in variance of the data. **TABLE 3** and **TABLE 4** show the final loading for all factors of KTM and LRT. The factor loadings for both rail transports were arranged based on the correlation level value for each item. The highest factor loading indicates the internal consistency of the scale [5]. Field, 2009 [14], stated that the numbers of data analysis more than 100 samples, the lowest factor value is more than 0.512 is refer to the cut-off value. The result of KTM indicates the highest factor loading is environment (0.839) followed by safety and security (0.801), reliability (0.772), responsive (0.740) and the lowest is physical facilities (0.711) with average internal consistency. On the other hand, for LRT the environment factor (0.917) produced strong internal consistency, followed by physical facilities (0.795), accessibility (0.741), reliability (0.733), safety and security (0.717) showed average internal consistency.

Table 3. Final Five Factor Scale with 24 Items for KTM

Factor	***Item***	**Factor loading**
Environment (0.839)	42. Cleanliness at terminal	0.903
	41. Internal and external cleanliness	0.848
	44. Level of noise pollution	0.810
	43. Comfortable temperature	0.796
Safety (0.801)	38. Presence of police and security guard	0.826
	40. Risk of interference from other passengers	0.820
	37. Personal safety from crime danger	0.818
	39. Lighting at terminal to prevent crime	0.739
Reliability (0.772)	46. Time travel	0.870
	45. Waiting time	0.864
	25. Timetable	0.801
	24. Interchange time	0.703
	27. Reliability of time table	0.697
	26. Arriving time based on scheduled	0.694
Responsive (0.740)	29. Instant feedback for the information needed	0.839
	22. Access from terminal to destination	0.746
	28. Assistance from the driver and staff when needed	0.741
	30. Travel information	0.740
	21. Access from home to terminal	0.633
Physical Facilities (0.711)	33. Safety at terminal	0.797
	34. Design of rail transport for passengers' comfort	0.797
	31. Facilities in terminal	0.732
	32. Facilities in terminal (sda)	0.636
	35. Design of rail transport for OKU passengers	0.595

Table 4. The Final Five Factor Scale with 21 Items for LRT

Factor	*Item*	*Factor loading*
Environment (0.917)	41. Internal and external cleanliness	0.918
	42. Cleanliness at terminal	0.915
Physical Facilities (0.795)	35. Design of rail transport for OKU passengers	0.827
	36. Fare system	0.820
	34. Design of rail transport for passengers' comfort	0.738
Accessibility (0.741)	22. Access from terminal to destination	0.845
	21. Access from home to terminal	0.817
	23. Interchange place/situation to destination	0.687
	24. Interchange time	0.703
Reliability (0.733)	26. Arriving time based on scheduled	0.912
	25. Timetable	0.841
	27. Reliability of time table	0.799
	46. Time travel	0.635
	45. Waiting time	0.607
	29. Instant feedback for the information needed	0.604
Safety & Security (0.717)	38. Presence of police and security guard	0.885
	40. Risk of interference from other passengers	0.860
	39. Lighting at terminal to prevent crime	0.779
	37. Personal safety from crime danger	0.681
	32. Facilities in interminal (sda)	0.583
	31. Facilities in terminal	0.513

KTM Komuter and LRT Performance System

The finding for both service performance show the 35.0% respondents were very satisfied towards the service provied by KTM meanwhile, 31.7% were satisfied towards the service which contributes to the second highest score. However, only 1.7% of the respondents were strongly dissatisfied with the service provided by KTM. On the other hand, the 38.0% respondents were strongly satisfied, followed by 44.0% of respondents who were very satisfied and 18.0% were satisfied towards the LRT service provided. LRT also considered as an attractive mode of public transport based on the empirical study which showed a high performance because none of the respondents chose strongly dissatisfied towards the service provided. From the finding of overall satisfaction, it can be concluded that most of the respondents were most satisfied towards LRT service compared to KTM.

CONCLUSION AND RECOMMENDATION

Managing sustainable transportation needs in depth system provisions where an efficient service will increase patronage of people and contribute to green environment through reduction in private car [14]. The findings found that five (5) factors are significant and contribute to the preference and satisfaction of KTM which are environment, safety and security, reliability, responsive and physical facilities. Meanwhile, for LRT, the five (5) factors found significant are environment, physical facilities, accessibility, reliability, safety and security. These entire factors can be used to measure the level of service performance provided by KTM and LRT based on the users' perception. The result indicates that users' satisfaction can significantly contribute to the sustainable transportation system in Malaysia, particularly in the Klang Valley area. The outcome of this study can provide benefit to all related agencies to encourage upcoming regulation on creating green transport infrastructure especially for Malaysia.

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