FACTORS INFLUENCING RIDERSHIP PREFERENCE IN USING LRT SERVICE IN KLANG VALLEY, MALAYSIA

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Abstract

Light Rail Transit (LRT) is one of the public transports that provides a lot of benefits to the Malaysian. Yet this consumption depends on the diverse tastes of potential ridership which are influenced by various factors. However, it is very challenging to predict significant factors influencing ridership preferences. As such, the identification of these factors is very important in ensuring this transportation service really attract ridership attention. Thus, this paper intends to identify the main factors that influence ridership preference in taking LRT transportation. 28 attributes have been identified in this research which expands from four (4) main components. Data were collected from ridership's survey, site observations and ridership statistical data. Pearson Chi-square has been employed to justify the significant status and the influence level of each LRT attribute and component factors toward ridership preference. The results show that 23 attributes recorded a significant status (<0.00) in two (2) different directions of correlation. Overall, three (3) component factors namely i) Comfortable Service, ii) Economics and iii) Indoor Environment Conditions, have influenced and contributed to the same effect on ridership considerations, as compared to the negative effects displayed by the Site Design Attributes.

Keywords: Influencing Factors, Ridership Preference, LRT, Public Transportation.

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INTRODUCTION

In Malaysia, the use of public transport is part of the Malaysians choice in planning their daily movements (Ona et al., 2020; Bohari et al., 2014) involving several different destinations such as the workplace, community resources, medical care and recreational place around the country. It is also seen to reduce congestion rates in urban areas (Ona et al., 2020). Therefore, public transport is very much needed in urban areas to facilitate the movement of urban life and support the development of the country (Batarce et al., 2016; Amiril et al, 2014). The use of public transport may contribute and provide a lot of benefits to the public at large such as environmental sustainability and the reduction of fossil fuel usage (Stjernborg & Mattisson, 2016). Besides, public transportation can be the best economical solution to overcome the financial challenges (Ustadia & Shopia, 2016) due to cheaper costs as compared to private vehicles.

Generally, there are a few types of public transport provided by the government to the people such as bus, taxi, motorcycle, rickshaw, bicycles, train, metro, ships and ferry (Ustadia & Shopia, 2016). However, transportation by rail is an efficient way to get around cities, especially with the Kuala Lumpur Monorail, Light-Rail Transit (LRT), Keretapi Tanah Melayu's (KTM) Commuter and Mass Rapid Transit (MRT).

RESEARCH BACKGROUND

Light-Rail Transit (LRT) is the first urban rail light public transportation introduced in Malaysia. Its operations have successfully provided various benefits to ridership. However, after years of operation, the LRT service is seen to be less popular due to different preferences among the riders. Accordingly, in an effort to overcome this problem, this study will identify the main factors that influence ridership preference in using this public transportation. Usually, various aspects can influence ridership choice in choosing public transport as the best option for them (Pawlasová, 2015; Wang & Liu, 2015; Bahreini et al., 2016). Thus, the selection of LRT as one of the main transportations is certainly based on several considerations.

LITERATURE REVIEW

Usually, various aspects can influence ridership choice in choosing public transport as the best option for them. Thus, the selection of LRT as one of the main transportations is critical to be assessed taking into account the ridership preferences. According to Zhou et al., (2014), time has become an important consideration among ridership when choosing public transport. It may refer to travelling time that heavily affects the passengers' decisions (Meng et al., 2018; Zhou et al., 2014; Gooze et al., 2013; Ren and Huang, 2020). Besides, saving time on public transport is a prominent factor when choosing the LRT system (Wang & Liu, 2015). However, according to Haywood et al., (2017), people

would have fewer opportunities to make use of the time during the public transport journey. Apart from that, passengers on public transport are also concerned about the cost that needs to be incurred each time they use this transport (Taylor, 2009; Tirachini and Antoniou, 2020). Low and affordable transportation costs are highly preferred by ridership (Tirachini and Antoniou, 2020), which may be contributed by subsidies (Zhang and Xu, 2017) as it can save the overall cost (Zakaria et al, 2017), besides, giving riders space to use these cost savings for other interests.

Ridership is also concerned about the convenience and comfort of the journey in using public transportation. Therefore, all the service and facilities that provide comfort during the trip has become the priority of ridership (Nikel et al.,2020; Sham et al, 2013; Bahreini et al., 2016). Among others, the things that lead to this comfort are the presence of a waiting area and comfortable seats for the use of riders (Haywood et al., 2017). The best condition of the toilets may contribute by the cleanliness, suitable equipment, as well as the sufficient number of toilet units, are seen to attract riders to continue using public transport services (Akmar Faisal et al., 2019). The same goes for the place of prayer which is very much needed by the riders, especially the Muslims (Kadir et al., 2020). In addition, the design of the stairs and the movement of the escalator also influence the intention of riders to continue to use public transport services (Chi et al, 2006).

The riders' decision to use the LRT service also tied to the site design and development (Ren et al., 2020). Usually, the location and site design of this transportation may influence the rider's choice (Abdullah et al, 2020). Generally, LRT has been developed in travel coaches as well as the placement of several stations which aim to facilitate travel operations. Thus, its development has included parking lots (Lambrinos et al, 2013), to make it easier for riders to park their vehicles before embarking on their journey with LRT. Therefore, the provision of parking lots is able to attract riders (Ho et al., 2017), to visit the LRT station and take LRT service. In addition, the distance from the parking lot to the LRT station also becomes the main consideration by riders to continue to take LRT transport (Hamsa et al., 2014). Apart from that, the riders are also seen to be very concerned about the distance (Minn, 2019) between their homes to the station (Huang et al, 2017), as well as the distance from the workplace to the station (O'sullivan and Morral, 1996; Sarker et al., 2017). This is because the close distance saves the entire travel time. Meanwhile, the availability of clear signage information will make it easier for the riders to taking LRT service (Bai and Kattan, 2013). Besides, good coverage of public transport may also influence ridership preference. However, according to Hensher et al (2015), this attribute does not influence LRT ridership.

Public transport should also prioritise good Indoor Environment Conditions (Sugiono et al., 2020). According to Ponni & Baskar (2015) and

Kadir et al (2020), the thermal performance of a building may be referred to as the process of modelling energy transfer between a building and its environment. Hot weather in Malaysia has pushed the interest of riders in this aspect. Among the aspects of this Indoor Environment Conditions (IEC) include Air Temperature, Humidity of Air Quality and Air Movement in public transport (Bridger, 2003; Wang and Zacharias, 2020). In addition, the high noise rate also makes riders less comfortable using public transport (Wang and Zacharias, 2020). Ridership is also concerned about the lighting level in the vicinity of the LRT service, especially for women who feel safer being in public transport (Brown, 2013).

The above discussion clarifies that several aspects may influence the ridership preferences in taking LRT service. Therefore, all these aspects have been formed under four (4) main components that become the basis of measurement for this study (Figure 1).
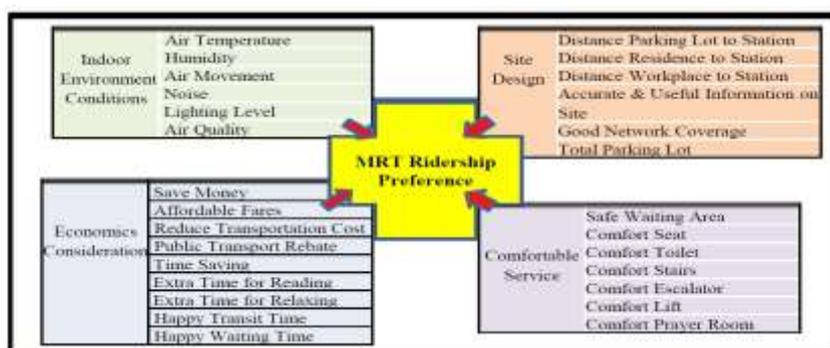

Figure 1: Theoretical Framework

METHODOLOGY

This study includes a few main sources of data namely survey data obtained from an interview for ridership, existing statistical data obtained from LRT management and observation data obtained from the on-site design. An observation task has been done in order to get information on the total unit of the parking lot and the distance from the parking lot to the main area of the station (metre). While for other attributes, data were obtained through a questionnaire survey and daily ridership data has been collected from LRT management at the same date of questionnaire distribution.

The Likert scale questionnaire was developed by emphasising 26 attributes expanding from four (4) main research components. The questionnaire has been distributed randomly to the LRT riders at ten (10) LRT stations in Kuala Lumpur.

All of the data has been allocated together as the main sample where the Ridership data has been correlated with all 28 attributes that expand from the four (4) main components. A Chi-square test has been employed to analyse the data. Attribute Any attribute with a score value of below 0.01 (Sig. 2-tailed) was considered significant to the study and would be further analysed with Pearson Correlation Analysis, to justify the existence of the relationship between the selected attribute and LRT ridership's score, explaining their decision and preference. A significant number of attributes will contribute to the Significant Status Frequency Score for each factor. The correlation value from the ridership data with the selected attribute will contribute to the Correlation Value Score by each component factor. The Status Frequency Score for Significant Attribute was aligned with the Correlation Value Score in order to derive the most influential factor on ridership decision. The Influence rate of LRT attributes towards ridership decision is given by the following equations:

Status Frequency Score for Significant Attribute
$= \sum sf\ (SiA)$…………………………………………………………………..…(1)
Correlation Score for Selected Attribute
$= \sum cs\ (SeA)$…………………………………………………………….……(2)
where,
$\sum sf$ = Significant Status Frequency score
SiA = Significant Attribute
$\sum cs$ = Correlation Value Score
SeA = Selected Attributes

The analysis is further analysed to find the average scores for the attributes that have been studied under the four (4) main components as discussed above. Table 1 shows the detailed information of the data concerning the distance of the workplace to the respective LRT station and the total parking lots available in each station.

Table 1: Detail information on distance and parking lot at LRT station

No	Station Name	Sample Allocation	Total unit of the parking lot	Distance parking lot to the main area of station (metre)	Station	Distance scale	Sample allocation according to scale
1	Subang Jaya	13.2%	86	10		Distance Workplace to station	
2	USJ 7	13.2%	61	20		<400m	29.6%
3	Alam Megah	8.0%	238	20		400m-800m	19.7%
4	USJ21	13.2%	466	30	Refer All station	800m-2km	20.0%
5	Wawasan	6.1%	51	10		>2km	30.8%
6	Taipan	16.5%	34	10		Distance Residence to Station	
7	Lembah Subang	6.6%	74	20		<400m	30.5%
8	SS15	9.6%	36	20		400m-800m	21.1%

9	Glenmarie	7.6%	770	10	800m-2km	73.1%
10	Ara Damansara	6.0%	50	10	>2km	27.9%

RESULTS & DISCUSSION

This study involved 904 samples from the selected ten (10) LRT stations namely, Alam Megah, Subang Valley, Ara Damansara, Glenmarie, Subang Jaya, SS15, USJ, Taipan, Wawasan and USJ 21. Each station represents a portion of the sample ranging from 6% to 13.3% (Table 1). Each station provides a total parking lot of between 51 to 770 units. It has been observed that the walking distance between the parking lot to the main station is about 10 to 30 metres.

Table 2 displays the average scores for the attributes under the four (4) main components. By employing the Likert Scale, 15 attributes obtained a score value of > 3.5, suggesting that most of the attributes have influenced the riders to choose LRT as one of their favourite public transport. The highest mean score indicated money-saving among riders (3.82). Only one attribute indicated < 3 which is 2.81 (Reduce Transportation Cost), meaning that the LRT service does not reduce the overall transportation cost.

Table 2: Mean score for attribute from ridership survey

Components	Attribute	Mean score
Site Design Attributes	Distance Parking Lot to Station	20 (metre)
	Distance Residence to Station	800 (metre)
	Distance Workplace to Station	800 (metre)
	Total Parking Lot	350 units
	Good Network Coverage	3.47
	Accurate & Useful Information on Site	3.60
Comfortable Service	Safe Waiting Area	3.57
	Comfort Seat	3.63
	Comfort Toilet	3.42
	Comfort Stairs	3.59
	Comfort Escalator	3.63
	Comfort Lift	3.59
	Comfort Prayer Room	3.64
Economics Consideration	Save Money	3.82
	Affordable Fares	3.65
	Reduce Transportation Cost	2.81
	Public transport Rebate	3.89
	Time-Saving	3.46
	Extra time for Reading	3.48
	Extra Time for Relax	3.58
	Happy Transit Time	3.47
	Happy Waiting Time	3.20
Indoor Environment Conditions	Air Temperature	3.71
	Humidity	3.58
	Air Movement	3.59
	Noise Level	3.11

Lighting Level	3.58
Air Quality	3.53

Next, a total of 28 attributes derived from the four (4) main components has been analysed to justify the significant status of the LRT ridership. Through Chi-Square analysis, the value of Sig. (2-tailed) for all attributes have been obtained as displayed in Table 3. Generally, only 21 attributes indicate the significant status of LRT's ridership (< 0.05). Next, all the significant attributes were further analysed with Pearson Chi-square to justify the influence of ridership towards the use of LRT services. Two (2) attributes indicate a negative correlation (-.197 **, -.343 **), while the other indicate a positive correlation within the value 0.090 ** - 0.197 **.

**Table 3**: Significant Status and Correlation Value between LRT Attribute and LRT's ridership

Component	Attribute	Sig. (2-tailed)	Significant status	Pearson Correlation
Site Design Attributes	Distance Parking Lot to station	.000	√	-.343**
	Distance Residence to Station	.262	×	-.045
	Distance Workplace to Station	.608	×	.021
	Accurate & Useful Information on Site	.000	√	.190**
	Good Network Coverage	.007	√	.108**
	Total Parking Lot	.000	√	-.197**
Comfortable Service	Safe Waiting Area	.001	√	.133**
	Comfort Seat	.005	√	.112**
	Comfort Toilet	.000	√	.142**
	Comfort Stairs	.002	√	.126**
	Comfort Escalator	.011	√	.102*
	Comfort Lift	.002	√	.122**
	Comfort Prayer	.025	√	.090*
Economics Consideration	Save Money	.165	×	.056
	Affordable Fares	.005	√	.112**
	Reduce Transportation Cost	.521	×	-.026
	Public Transport Rebate	.921	×	-.004
	Time-Saving	.025	√	.090*
	Extra Time for Reading	.000	√	.162**
	Extra Time for Relax	.001	√	.137**
	Happy Transit Time	.092	×	.067
	Happy Waiting Time	.350	×	.038
Indoor Environment Conditions	Air Temperature	.012	√	.100*
	Humidity	.001	√	.127**
	Air movement	.003	√	.119**
	Noise	.016	√	.096*
	Lighting Level	.000	√	.197**
	Air Quality	.004	√	.115**

Figure 2 shows the influence rate of Site Design attributes on ridership preferences. The results of the study found that the riders quite particular with the distance between the parking lot and the location of the LRT station at -34%. This

shows that the farther the distance between the two (2) locations, the less priority of riders to visit the LRT station, thus affecting their decision to use the LRT service. A similar effect found for the number of parking units provided around the LRT station. The more the parking units are provided, the less priority of ridership to visit that station by 20%. This is because the provision of many parking units will require a large site allocation for the parking area as well as creating a large distance between the parking lot and the LRT station. This has caused riders to have to walk at a relatively long pace to enter the station area. On the other hand, the LRT service, which involves a network of many stations and covers several key areas, has encouraged ridership to continue taking this transportation which is 11%. Similarly, the information facilities and clear signage at the LRT Station have succeeded in attracting passengers to continue using this service, which is 19%. The six (6) attributes under Comfortable Service component have influenced ridership's decision in using LRT transportation at different rate level (Figure 3).

Good Quality of Toilet provision has contributed 14% to ridership preferences. However, only 1% is contributed by the worship facilities because most riders prefer to perform prayers at home instead of at the station. Under Economics Consideration, the results show that the allowable time for ridership to rest and the opportunity of reading activities has influenced their decision to use the LRT service by 14% and 16%, respectively. Meanwhile, low ticket costs also affected the LRT ridership by 11%. This shows that the Malaysian community is very concerned about the free time they get during their journey in the LRT.

Besides, all attributes under the IEC have recorded an influencing rate between 1% to 13%. The Noise Level had indicated the lowest value of 1% may be contributed by a large number of riders at LRT service. The emphasis on high lighting rate (20%) is due to the need for a high safety rate among ridership. While the rate of air movement and humidity also become ridership concerns because it provides comfort during the journey of the LRT service. Apart from that, the hot weather conditions in Malaysia influence the riders to give priority to the cool air, if they were available at the station. Thus, good air -conditioning will greatly influence the riders' decision to continue using the LRT service.
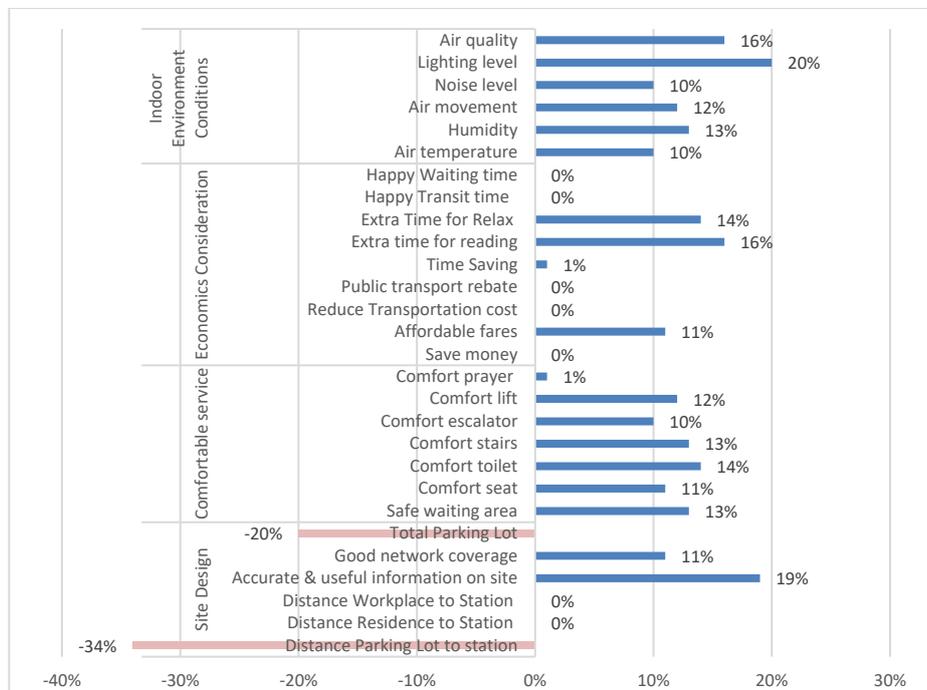
Figure 2: The influence of component factors and attributes towards ridership preference

All significant attributes (21) were aligned with the correlation score according to the four (4) components in this study. The research found that these four (4) components have influenced ridership preference in taking LRT transportation. However, the Site Design Attributes have given a different influence, through the number of parking units and also the distance that exists between the parking area to the main station area (Table 4).

Table 4: Frequency Status and Correlation Score of significant attributes

Component Factor	Status Frequency score for Significant Attribute	Correlation Score for selected Attribute	$\sum sf\,(SiA)\,/\sum cs\,(SeA)$
	$\sum sf(SiA)$	$\sum cs\,(SeA)$	
Site Design	4.00	-24%	-6%
Comfortable Service	7.00	74%	11%
Economics	4.00	42%	11%
Indoor Environment Conditions	6.00	68%	11%

Figure 3 shows the influencing level of the four (4) components towards ridership where the site design of the LRT development has contributed a negative impact on ridership preference as compared to the other 3 components.
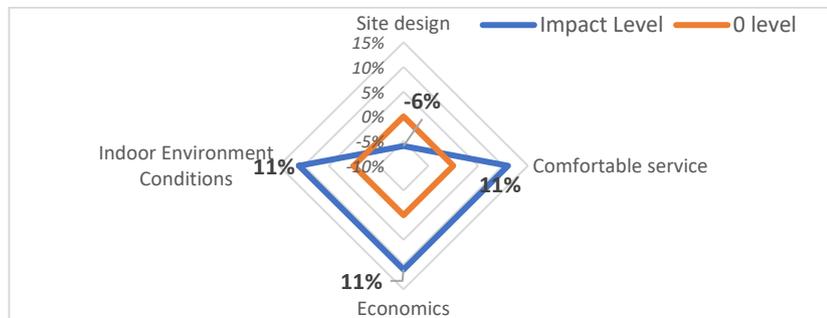
Figure 3: Influencing level by four (4) components towards ridership preference in using LRT service in Malaysia

CONCLUSION

In general, out of the 28 attributes identified in the study, there are only 23 Attributes from the four (4) component factors that influence the decision of LRT ridership to continue choosing this transportation as their choice as compared to other types of transportation. However, the results of the study show that the site design is one of the factors that reduce the intention of using the service as displayed by the negative impact results. Although only 6% has contributed by this factor, it could have a direct impact on the use of this transport in the future. Therefore, the positive impact of the other three (3) main factors, especially related to the indoor environmental condition should be maintained in terms of quality and maintenance work to sustain the ridership of LRT service.

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