Travel Behaviour and Society 12 (2018) 1–10

Contents lists available at ScienceDirect

Travel Behaviour and Society

journal homepage: www.elsevier.com/locate/tbs

Determining the service quality of the city bus service based on users' perceptions and expectations

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ARTICLE INFO

Keywords:
Service quality
Users' perception
Users' expectation
Level of service
City bus service

ABSTRACT

This study aims to find out the service quality of the city bus service based on users' perceptions and expectations of the service. The results of this study show that both perceptions and expectations of the passengers' are important to estimate the service quality. To collect the passengers' perceptions and expectations data, a questionnaire survey has been conducted and the respondents are asked to rate some qualitative attributes of the city bus service as per their perceptions and their minimum expectations from the service. Data has been analyzed by a combination of statistical tools comprising of factor analysis, linear regression analysis, and structural equation modeling to find out the latent factors which affect users' perception and expectation. From these analysis four latent factors namely safety, comfort, accessibility, and timely performance have been extracted along with their perceived and expected values. Using the percentage differences of the perceived and expected values, a level of service (LOS) scale has been established to find out the service level of the city bus service. The range of this LOS scale varies from LOS 1 to LOS 5 depicting best to worst service quality. It is found that, safety, comfort, and timely performance fall under LOS 3 group while accessibility falls under LOS 2 group. Based on the results of the study, some recommendations have been made to improve the service quality of the bus service.

1. Introduction

In India, around 32% population is residing in urban areas and this is likely to increase to 40% by 2030 (NIPFP, 2007). This rapid growth in population in the cities has resulted in an increased demand for the transportation infrastructure which has caused to an increased use of the vehicles across the city resulting in congestion. In India, the number of motor vehicles is doubling every four years for the last three decades (MORTH, 2004) to meet the increasing demand for transportation. The vital problem is not the increasing number of the vehicles in the country but the maximum concentrations of the motor vehicles in the cities (Singh, 2005). Around 32% of the total registered vehicles in India are operating in the cities alone (Singh, 2005). This increasing numbers of the motor vehicles in the cities also caused some detrimental effect on the environment. Transport sectors in India emit nearly 261 Tg of CO_2, of which 94.5% was emitted by the road transport (Sharma et al., 2011). Among the different vehicle classes, the number of two wheelers is highest among the other vehicle classes with a proportion of more than 73% in total vehicle population followed by three wheelers with a proportion of 15% and passenger vehicles with a proportion of 10% (Sharma et al., 2011). The proportion of commercial vehicle is very low, near about 5% (Sharma et al., 2011). These huge numbers of two wheelers and three wheelers are mostly responsible for the over-saturation of the traffic flow on the city roads resulted in congested city traffic (Sharma et al., 2011). With an increased income and better need for mobility, the number of private vehicles is increasing rapidly in the country. According to recent data, the sales of private vehicles have increased by 9.23% where the sales of commercial vehicles have increased only 4.16% in April-March 2017 over the same period last year (SIAM, 2017). As per the MoUD (2008), the mode share of the public transport will decrease from 5% in 2007 to 2% in 2031. They also predicted that the mode share of the non-motorized vehicles will go down from 38% in 2007 to 26% in 2031. Smaller and medium sized Indian cities are rapidly growing, and mode share of the private transport are also predicted to be increased from 57% in 2007 to 72% in 2031 (MoUD, 2008). From these data, it can be said that, though the non-motorized transport occupies a significant mode share in present situation but it tends to decrease in near future and maximum of the current users of the non-motorized transport will shift to private vehicles for their commuting needs. This will increase the number of private vehicles in the cities and will eventually deteriorate the already prevailing traffic congestion. This increasing growth of the private

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https://doi.org/10.1016/j.tbs.2018.02.008
Received 9 July 2017; Received in revised form 14 February 2018; Accepted 27 February 2018

vehicles has also accelerated by the poor service quality of the public transport available in the cities (Badami and Haider, 2007). Therefore, it is very much important to improve the service quality of the public transport system. Public transport have the potential to reduce the number of private vehicles in the cities and it is able to extend the transport service to the proportion of people who do not have any private vehicles and who cannot afford the frequently changing para-transit or taxi fares (Nwachukwu, 2014). Therefore, an improvement of the public transport is necessary to reduce the dependency on the private cars and other modes of transport and helps to reduce the problems like traffic congestion, air and noise pollution, parking problems and energy consumptions (Nocera, 2011).

The major mode of public transport in most of the Indian cities is buses. The number of private vehicles and paratransit modes is increasing day by day in the cities because of the poor service quality of the city buses. Therefore, it is very much important to improve the service quality of city buses to minimize the use of private vehicles. To improve the service quality, Ministry of Urban Development (MoUD, 2009), GOI has taken some initiatives to measure the service quality of the city buses. The performance measurement of the service quality is based on the benchmarking technique which measures the level of service (LOS) of different performance indicators representing the city bus service. MoUD (2009) prescribed six performance indicators and they are presence of organized public transport, availability of public transport, service coverage, average waiting time, load factor, and percentage fleet. In this report, the service quality of these performance indicators is measured through an LOS scale, ranging from LOS value 1 to 4 representing the best to worst service quality. All these six performance indicators are quantitative in nature and expressed as numerical values which are compared with some standard values to represent their service levels. These standard values are developed on the basis of some expert judgments without considering the users' perception from the service. Therefore, they are the service quality from the operators' perspective (Joewono et al., 2016) and are very much inadequate in representing the passengers' perceptions of the service.

The overall method for developing the service quality of the service depends on the priorities of the passengers (Hensher et al., 2003; Joewono et al., 2016). The perception based measure of the service quality is a vital tool for assessing transit service quality (TRB, 2003). The perceptions of the users of the transit facilities can be evaluated by using importance and satisfaction measures of the transit system (Diana, 2012; Iseki and Smart, 2012; de Oña and de Oña, 2014). The performance measurement of the transit service based on the perceptions and satisfaction data are qualitative in nature and they truly depict the users view on the available transit system. Researchers have used different multivariate data analysis techniques to analyze the satisfaction data to understand the key identifying factors which affect the users' perceptions of the transit service. Among the different statistical techniques, exploratory factor analysis (Hu et al., 2015; Jomnonkwao and Ratanavaraha, 2016; Nwachukwu, 2014; Popuri et al., 2011; Tyrinopoulos and Antoniou, 2008), confirmatory factor analysis (Hu et al., 2015; Jomnonkwao and Ratanavaraha, 2016; Ratanavaraha et al., 2016; Wen et al., 2005), structural equation modeling (de Oña et al., 2013; Eboli and Mazzulla, 2007; Eboli and Mazzulla, 2012; Jen and Hu, 2003; Lai and Chen, 2011; Machado-León et al., 2016) are widely used by different researchers to identify the major factors which affects the different attributes of the transit service. Comfort (dell'Olio et al., 2011; Eboli and Mazzulla, 2011; Filipović et al., 2009; Popuri et al., 2011), driver behavior (Cafiso et al., 2013; Chang and Yeh, 2005; Jomnonkwao and Ratanavaraha, 2016; Ratanavaraha et al., 2016; Sezhian et al., 2014), fare (Joewono et al., 2016; Popuri et al., 2011), safety (Joewono et al., 2016; Popuri et al., 2011), information about the service (de Oña et al., 2013; Eboli and Mazzulla, 2007; Filipović et al., 2009; Hu et al., 2015), customer service (Eboli and Mazzulla, 2011; Lai and Chen, 2011; Machado-León et al., 2016), frequency (de Oña et al., 2013; Tyrinopoulos and Antoniou, 2008), waiting time (Bordagaray et al., 2014; Tyrinopoulos and Antoniou, 2008), reliability (Bordagaray et al., 2014; Eboli and Mazzulla, 2007; Tyrinopoulos and Antoniou, 2008), cleanliness (de Oña et al., 2013; Popuri et al., 2011), accessibility(de Oña et al., 2013; Filipović et al., 2009; Tyrinopoulos and Antoniou, 2008), punctuality (de Oña et al., 2013;Sezhian et al., 2014), availability (Hu et al., 2015; Tyrinopoulos and Antoniou, 2008), service quality (Jen and Hu, 2003; Kaplan et al., 2014; Popuri et al., 2011), on-board amenity (Sezhian et al., 2014; Wen et al., 2005) etc. are some of the performance indicators which are reported by various researchers. Besides identifying the latent factors researchers also evaluated the relative weight of all the factors by using multinomial logit model (dell'Olio et al., 2011; Eboli and Mazzulla, 2008), ordered probit model (Bordagaray et al., 2014; Rojo et al., 2013), ordered logit model (Rojo et al., 2013) and regression analysis (Chang and Yeh, 2005; Nwachukwu, 2014).

All the previous studies identify users' perceptions as an important tool to measure the service quality. They also provide an insight about the unobservable or observable factors which effect users' perceptions. Most of the previous studies provide a good measure of the existing service quality but very few studies (Verma et al., 2014; Sam et al., 2017) provided a measure of the expected or desired service quality. The quality requirement of service varies with the expectation of the users. Therefore, it is very much important to know the passengers' expectations from the service in addition to their perceptions about the service. Moreover, most of the previous research works failed to acknowledge the procedure for finding the service level of all the factors which affect the overall service quality of the transit service. Therefore, the aims of this study are: (1) to identify the important factors which affect users' perception and expectation of the city bus service, (2) to estimate the service levels of all the factors based on users' perception and expectation of the service, (3) to find out the importance of users' expectation in determining the overall satisfaction of the service.

2. Study area and selected transit system

The city bus service of the Agartala city has been considered for the quality assessment in this study. Agartala is small sized Indian city and the capital of the Indian state Tripura. The population of the city is 400,004 as per the 2011 census data. As per the ministry of road transport and highways, during the years 2005–2015 the average annual growth rate of the registered vehicles of Tripura is 14.5% which is highest among the different states of India (MORTH, 2004). Agartala is the capital of Tripura and it is quite natural that the growth rate of the vehicles in Agartala is more than the state average. In Agartala, among the total registered vehicles, the number of two wheelers is found to be highest with 69%, followed by light motor vehicles (jeep/taxi/van/car) with 16.1%, three wheelers with 8.8% and buses with only 0.98% (Transport Department, 2017). In terms of mode share, 37.2% trips generated in the city are non-motorized (Sarkar and Mallikarjuna, 2017). The remaining trips (62.8%) are either made by city buses, auto-rickshaw or private vehicles. But most of the trips among the motorized trips are made by either auto-rickshaws or two wheelers (Sarkar and Mallikarjuna, 2017) which made the city traffic congested during peak hours. Nevertheless, in India, the mode share of the non-motorized modes and public transportation is decreasing rapidly for cities like Agartala with population less than five hundred thousand (MoUD, 2008). These decreasing trends in the non-motorized modes and public transportation will lead to increase the number of private vehicles and auto-rickshaws in the city. Paratransit modes are considered important for such type of small Indian cities to meet with the travel demand. But these types of vehicles are operated by the private operators and they cause serious emission and safety violations (Pojani and Stead, 2015). Small sized Indian cities are growing rapidly which causes to an enormous increase of the travel demand in such type of cities (MoUD, 2008). To meet with this demand, maximum of the funds are allocated to widen the road which primarily benefit the private vehicle users