Scientific Research Publishing

Journal of Transportation Technologies, 2023, 13, 632-643
https://www.scirp.org/journal/jtts
ISSN Online: 2160-0481
ISSN Print: 2160-0473

Features Desired in Public Transport in a Developing City: Users' Perspective

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How to cite this paper: Imtiyaz, Md.N., Sobhani, Md.G. and Emtiaz, M. (2023) Features Desired in Public Transport in a Developing City: Users' Perspective. *Journal of Transportation Technologies*, **13**, 632-643.
https://doi.org/10.4236/jtts.2023.134028

Received: August 25, 2023
Accepted: September 19, 2023
Published: September 22, 2023

Abstract

Excessive growth of population and urbanization in the developing countries set an increasing demand of mobility services. To meet this demand, public transport plays a significant role by providing an easy and affordable mobility service. Public transport service is a process evolving over time nevertheless is not always directly responsive to the changing demand of the passengers. Recently in developing countries, the unpleasant experience in public transport services is seen as one of the main reasons behind increased passenger car share, which eventually lead to traffic congestion. However, the situation can be ameliorated if the features of the public transport are improved by addressing the users' demand. In this study, the primary features desired and demanded by the passengers of a developing country are identified by three phase survey. These identified features are also categorized based on public responses. And finally, the required features in an appropriate public transport mode are prioritized by using a common Multi Criteria Decision Making approach (AHP—Analytic Hierarchy Process). The study suggests that residents of the developing city are not that much concern on the outlook and ambience of the service rather they are concerned about finishing their trips safely in time at an affordable rate. The findings of this research will help planners and decision makers to make the best use of the investment in public transport services and infrastructure to promote these modes over privately owned vehicle.

Keywords

Public Transport, Feature, Analytical Hierarchy Process (AHP), Questionnaire, Respondents, Weightage

1. Introduction

In the last few decades rapid urbanization has led to an unprecedented increase in demand for mobility services in developing countries, which has put remarkable pressure on urban public transport infrastructure and services [1]. Currie *et al.*, (2018) reported transport modes as a major economic, social, and environmental encounter to the functioning world cities. Moreover, pollution, congestion, accidents, public transport decline, lack of accessibility making the situation even worse for the developing countries [2] [3]. A major portion of the residents in the developing cities depends on reasonable Public Transport (PT) services and non-motorized transport (NMT) for their mobility demand [4]. Capacity, cost-effectiveness, spatial rationality, and ecological acceptability allow most of the public transport to serve as the outline for mobility [5]. In the developing cities, lower-middle- and lower-income groups are especially heavily dependent on public transport [6] [7]. This dependency is mainly because of low ownership of personal vehicles. Despite the importance of public transport, its services are often deprived in developing countries [8]. In recent times, the lack of quality public transport services is the reason for passenger car holding a significant share in the distribution of transport modes in urban areas [5]. Owing to advantages such as convenience, flexibility and safety there has been a rapid growth in use of private ownership vehicle in urban areas [9]. In case of public transport a number of factors influence the shape of the system in a city. For instance, according to Simpson (1994), the size of city, level of development or urbanization, travel pattern, and land use are the most significant factors influencing the public transport system. Besides, along with the length of the journey, people consider various aspects of the route to make their decision while making a choice of transport mode to travel [10] [11] [12] [13]. Selecting travel mode of individual person's trips is also influenced by some internal and external factors. These factors that determine selection of a particular travel mode could be grouped as the characteristics of the "trip", the "trip maker", and the "transport system" [6]. External factors are the attributes related to public transport service and their operation, which are often beyond the control of the user (*i.e.* headway, fare, etc.), whilst internal factors include the intuitive decision making attributes of a user, on which he has control (*i.e.* income) [6] [14] [15]. From the users' perspective there are also some desired factors for public transport they like to experience as better comfort, safety, efficiency, affordability etc. There is an extensive field of research showing the importance of public transport from a sustainable perspective and to the different dimensions of sustainability—not least the ecological and economical dimension. Dell'Olio *et al.* (2011) assessed the quality of service desired by public transport users of the city of Santander using multinomial discrete choice models. Yet again, the interest for the social sustainability has increased as well, from foremost being dominated by ecological and economical perspectives since the late 1980s. Within the area of transport policy, for example, the social dimension now constitutes an important challenge all over the world [16] [17] [18] [19].

The objective of this paper is to explore the existing public transport situation and passenger experiences of a developing country. Considering the travel pattern of people and their expectation regarding the public transport, the paper tries determining the apt form of public transport and providing guidelines to deliver "appropriate" public transport facilities for passengers. "Appropriate" in this paper refers to reliable, affordable, safe, efficient (in terms of travel time and waiting time) formal public transport services. The study restrains itself only to land transport mode.

2. Study Area

Dhaka, the capital city of Bangladesh has been selected as the study area. This city presently is one of the 19th largest mega-cities of the world with a population of about 18.0 million [20] [21]. The population density is as high as 20,000 per sq·km. The city represents less than 1% of the country's total land area supporting about 10% of the population. There has been a phenomenal growth in terms of population and area in the last four decades. Annual growth rate of Bangladesh's population was 1.8 percent per year between 1998 and 2005 but Dhaka's population has increased at an astonishing average annual rate of 9.1 percent since 1999 [22] [23]. Such the massive residents are expected to generate a commensurable number of trips each day. Though currently the city generates around 22 million trips per day of which 55% is either walking or non-motorized vehicle trips, a large portion of the residents always needs public transport facilities for their mobility purposes [6] [24] [25]. It is projected that the city will generate nearly 160 million trips per day by 2024 [24] [26]. There are around 1 million motorized vehicles plying on the streets of Dhaka [27]. Older statistics suggest that number of motorized vehicles per 1000 population in Dhaka is only limited to 30 among which defective and old aged vehicles' proportion is almost 70% - 80% [28]. Only 3.6% of the registered vehicles are either bus or minibus [24] but they are the primary travel mode in 77% motorized trips. In all cases users' choice of selecting a particular type of public transport mode depends on various factors such as travel time, travel cost, comfort of the mode, safety, and security condition etc. Dhaka city has a multimodal transport infrastructure and as a result it has been a need for investigating the customer desired development in the present state public transport service [6] [29]. This study considers the whole city's public transport modes. The city public transport system is heterogeneous, *i.e.*, consisting of both motorized and non-motorized vehicles [30] [31]. Among the non-motorized modes rickshaw is the most popular mode in the streets of Dhaka. Bus and CNG plays a key role in Dhaka city's transport system as motorized public transport mode. Where travelling by the bus is convenient among young students and commuters, due mainly to the inexpensive fares, high capacity and availability. Due to growing pressure on public transport, it has become essential to opt for a more effective means of transport mode. In this regard, to ease the congestion and provide a safe, affordable, comfortable, and

environmentally friendly solution, Bus Rapid Transit (BRT) Metro Rail Transit (MRT) has been introduced to Dhaka. However, there is always necessity to upgrade the current state of public transport modes especially the bus services for the residents of this city to ease the enduring difficulties [30] [32].

3. Methodology

3.1. Three-Phase Questionnaire Survey

In this study a three-phase survey was conducted. In the first phase a comprehensive field survey of households was carried out for investigating the travel modes, major travel routes of the people of Dhaka city. Due to resource constraints only 45 households were selected using a Stratified Systematic Random Probability Sampling method and members of the selected households over 12 years of age were interviewed in March 2017. After identifying the travel pattern of the city dwellers from the household survey eight major zones (Ajimpur, Farmgate, Uttara, Mirpur-10, Motijil, Shantinagar, kakoli, Malibagh) are identified to conduct the second phase of survey. These eight zones cover almost 95% of the overall travel route of the respondents of the household survey. In this second phase a questionnaire survey was conducted to find out the key desired factors in public transport. A total of 395 (more than 92%) individual respondents were found valid for this study and considered for the analysis. The remainder (less than 8%) hardly uses public transport because they either walk or use personal or family-owned vehicles. Some of the respondents (35 out of 395) in this phase were also given their view by social media (Facebook). This technique was used to collect responses from the female passengers mostly. From this survey the key desired factors in a public transport mode were collected from the passenger perspective.

After the extensive data collection through second phase questionnaire survey a multi-criteria decision making (MCDM) tool was needed to prioritize the factors. The overall methodological framework is shown in **Figure 1**.

Quantitative methods, such as, MCDM provides a set of methodologies that enable the development of models allowing for the decision makers' preferential system and judgment policy [33] [34]. Some of the frequently used MCDM include AHP (Analytic Hierarchy Process), ANP (Analytic Network Process), TOPSIS, Goal Programming, Value Engineering (VE), etc. AHP and ANP determine the relative importance and give a ranking to the alternatives [35]. As to compare by AHP analysis we need persons who had prior knowledge about AHP; in the third phase of the survey there was a very few respondents (twenty five). These respondents were comprising of transportation researchers, faculty members and transportation planners. They were provided ample background on the research.

3.2. AHP Method

AHP in this study is applied to calculate the relative weightage of the six major

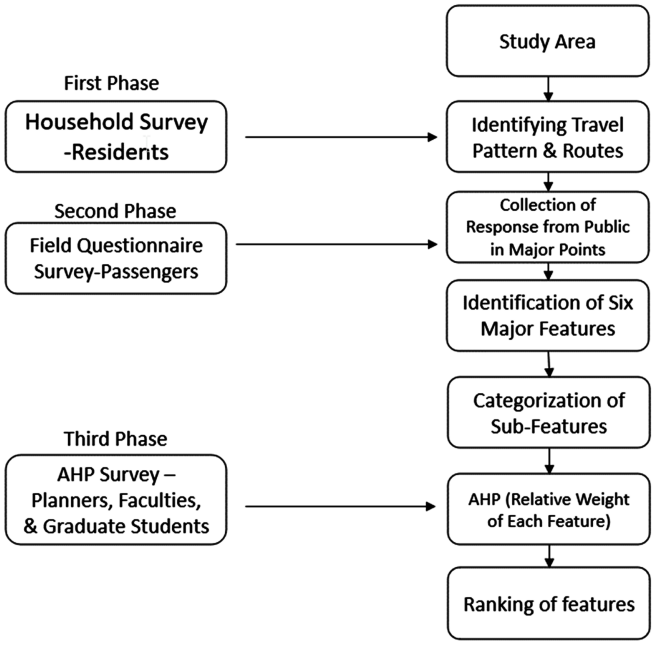

Figure 1. Methodological framework.

and fourteen sub features. From this MCDM approach the key features desired in a public transport mode can be also prioritized by comparing them among themselves.

While forming comparisons, we need a scale of numbers that indicates how many times one element is more important or dominant over another element with respect to the compared criterion or factor. To formulate the comparison SAATY'S Ratio Scale shown in **Table 1** is used [36]. Here, if feature *i* is extremely more important than feature *j* and is rated at 9, then *j* must be extremely less important than *i* and is valued at 1/9.

4. Results and Discussions

4.1. Questionnaire Survey Respondent Characteristics

In the first phase of the survey a response from 45 households were collected to identify their major demand for the perfection of the current state of public transport. The survey helped in identification of the following eight major zones within the city: Ajimpur, Farmgate, Uttara, Mirpur-10, Motijil, Shantinagar, Kakoli, and Malibagh where major public transport demand arises. While collecting the data from the common public a special care was given to ensure the respondents have a minimum level of education, and their concern about the current state of public transport. A total of 395 respondents were selected for the second phase survey. The respondents were selected in such a way that the survey becomes free from undue biasness for which the age share and gender fraction were given importance. The age distribution and the gender proportion are shown in **Figure 2**. It is observed that most of the respondents were from age group 12 - 20 and 21 - 30, and around 77% of the respondents were male.

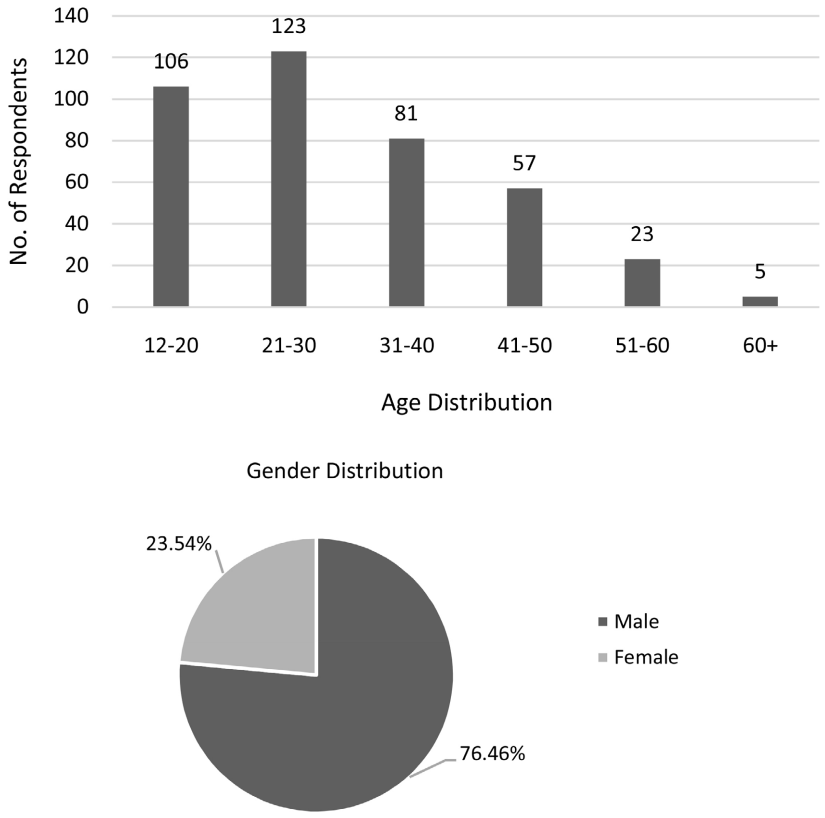

Figure 2. Age distribution and gender fraction of the respondents.

Table 1. SAATY's Ratio Scale for pairwise comparison.

Intensity of Importance	Definition
9	Extremely Important
7	Very strongly Important
5	Strongly Important
3	Moderately Important
1	Equally Important
2, 4, 6, 8	Intermediate values between two adjacent judgments

4.2. Key Features Desired for an "Appropriate" PT

From the field survey (second phase of the overall survey) of the respondents (395) six major features were identified of an appropriate public transport. These key features again classified them into some sub-features for easy understanding for public and better analysis.

1) Time Efficiency: It is the time efficient characteristics of a public transport which can be discussed in two parts. a) Delay while starting the trip, b) Waiting time in route during the trip.

2) Performance: The overall performance of the mode to make journeys desirable and comfortable. It has two parts. a) Convenience, b) Comfort.

3) Ambience: The inclusive environment of the public transport mode during travelling can be divided into three parts: a) Cleanliness, b) Air conditioned, c) Driver and conductor behavior.

4) Affordability: This term means the monetary value (cost) of the opportunity to travel by a particular mode, whether it is affordable by the passenger or not.

5) Safety and Security: Customer's impression about personal safety arisen from three points of view: a) No Accident Risk, b) Chance of Pickpocketing, c) Chance of Harassment.

6) Service Characteristics: The general service characteristics of the vehicle mode alike whether it is easily available or not, its accessible location has a specific point or not and other characteristics. It has four parts: a) Availability, b) Easy Accessibilit, c) Seating Service, d) High Capacity.

4.3. Weightage of Features

The weightage of various factors was calculated by conducting AHP survey (third phase survey) involving 25 respondents comprising of transportation researchers, faculty members and graduate students of transportation engineering. Most of the respondents had erstwhile acquaintance about AHP approach. Those who were not involved in AHP surveys before this study they were given the basic idea of the AHP methodology and background of the study. From the weightage of different factors, the ordering can be easily done based on their respective value. The results are illustrated by **Figure 3**. The aggregated outcomes were then further discussed with the respondents to authenticate their validations.

From **Figure 3**, it is clearly noticed that the most important factor from the point of the passenger of an appropriate public transport is its safety and security issues (0.322082). It is very much rational as people care more about their safety and security rather than other factors during their travel, even if they must pay more for a single trip. However, after fortifying the safety the second most desired feature by the passenger of an appropriate PT is its affordability (0.185181). It is also justified if the cost of the mode is more it is very predictable that it will

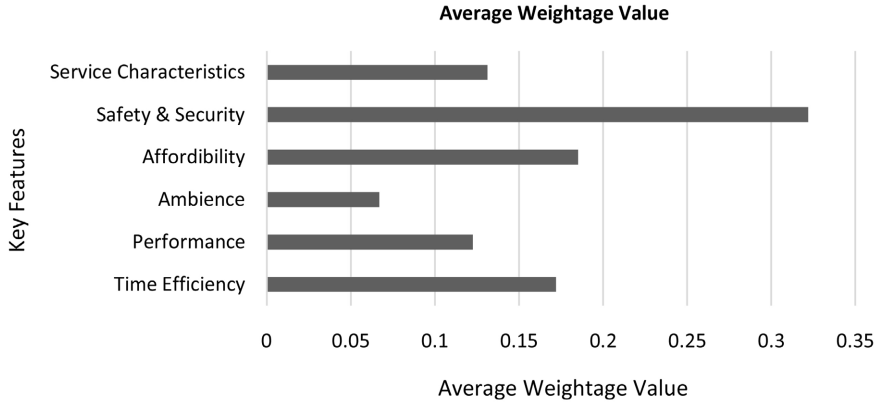

Figure 3. Average weightage value of the key factors by AHP.

lose aptness from the low- or middle-income group of people. After these two features the third and fourth features are time efficiency (0.17205) and service characteristics (0.131267). As people often perceive these two features as very essential after the safety and price issues. Yet again, from the result it is also identified that passenger care less about the ambience during the trips of public transport rather they prefer more comfort and convenience on their trips.

4.4. Weightage of Sub-Features

It is also very important to prioritize the sub-factors which may also create a driving force to make a public transport suitable and appropriate for the mass people of the developing country. Here a point to be noticed that the sub features can be two types. Either positive (+) or negative (−). Here if the sub feature is positive the more value of the weightage makes it more important. If the sub feature is negative the lesser the value of weightage more the importance of it to the passengers. These are shown in Table 2. In Table 2, overall weightage value is calculated by multiplying the major feature weightage value and sub feature individual weightage value.

Among the six major features, other than affordability all the other features have two or more sub features. Among the sub features under safety and security; people care more about the accident risk (0.81007) during a trip rather than

Table 2. Average weightage value of the sub-features.

Major Features with their weightage value	Rank of the major features	Sub-Features	Average Weightage Value	Overall Weightage Value	Rank of the sub features
Time Efficiency (0.172050)	3	a) Delay while starting (−)	0.64628	0.06086	2
		b) Waiting time in route (−)	0.35372	0.11119	1
Performance (0.122489)	5	a) Convenience (+)	0.48221	0.05907	2
		b) Comfort (+)	0.51779	0.06342	1
Ambience (0.066931)	6	a) Cleanliness (+)	0.71235	0.04768	1
		b) Air Conditioned (+)	0.12432	0.00832	3
		c) Well Behavior of Driver and conductor (+)	0.16333	0.01093	2
Affordability (0.185181)	2	-	-	-	-
Safety and Security (0.322082)	1	a) No Accident Risk (+)	0.81007	0.26091	1
		b) Chance of Pickpocketing (−)	0.16325	0.05258	3
		c) Chance of Harassment (−)	0.02668	0.00859	2
Service Characteristics (0.131267)	4	a) Availability (+)	0.42691	0.05604	1
		b) Easy Accessibility (+)	0.18752	0.02462	3
		c) Seating Service (+)	0.29739	0.03904	2
		d) High Capacity (+)	0.08818	0.01158	4

the chance of pickpocketing or harassment. The important hint to notice here is that, between the latter two sub features people want more a journey free from harassment. Though the value of chance of harassment (0.02668) is less than the chance of pickpocketing (0.16325) but as they both are negative features so here it means people care more about the harassment issue. This is also justified as a fine portion of the respondents were female and they rank this feature as much more important comparing to the other one. In case time efficiency people prefer more delay time while starting the journey than waiting time in route. Here waiting time in route (0.35372) has less weightage value than delay while starting (0.64628) but as they both are also negative, so it means that people prefer the first one rather than the second feature. In case of comfort and convenience under the feature performance, they both are almost treated as equal important. In case of ambience people care more about the cleanliness (0.71235) of the mode than the other sub features as the value of weightage is more and all the sub features are positive. In addition, for service characteristics, all the sub features are positive, and the value of mode availability (0.42691) is more which makes mode availability the most important feature for a public transport than other mode characteristics such as easy accessibility, seating service and high capacity.

5. Conclusions

Even though more than 92% of the respondents of this survey use public transport, their expectations are not addressed by the current state of public transport facilities. They are forced to use the service for mobility in an affordable price. Almost all the respondents were concern about their safety and security issues during their trips in the streets of Dhaka and expressed dissatisfaction on the current public service. They also concern about being the most important motorized mode of public transport significant improvement must be made to make bus service more safe, cheaper, and comfortable to people.

In the questionnaire survey of this study the selection process of respondents was so that they have a basic level of education. Time Efficiency, Performance, Ambience, Affordability, Safety and Security along with Service Characteristics were the six major features identified by the study as the key factors of an appropriate public transport mode. Among these, after AHP analysis Safety and Security were ranked highest for an "appropriate" public transport mode which reveals that people feel much more assured to use a safe and secure transport even if the cost or the travel time is more. Whereas other features were ranked in following order as affordability, time efficiency, service characteristics, performance and finally ambience. It is well perceived that in a developing city people are not that much concern on the ambience of the service rather they are concerned about finishing their trips safely in time at an affordable rate. A more in-depth study was also conducted by identifying the sub features from the key factors and again these were ranked among themselves. Among the sub-features it is found that more concern were given to avoid the risk of being in an accident rather than in-vehicle unsafe situations.

This study will help the policy makers to create strategic guidelines to provide safe, cheap and time efficient public transport modes to reflect the preference and expectations of the mass people. Yet again, if the expectations of the PT users' can be fulfilled, then the attractiveness of the public transport will increase which will ultimately decrease the tendency to own a private vehicle. Besides, it is very much likely that if the acceptance of public transport increased and car ownership decreased, many teething troubles like traffic congestions, air pollution can be lessened.

Acknowledgements

The authors would acknowledge the help of Mr. Shoumic Shahid Chowdhury for his contributions in the data collection phase of this study.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

References

[1] Kumar, M., Singh, S., Ghate, A.T., Pal, S. and Wilson, S.A. (2016) Informal Public Transport Modes in India: A Case Study of Five City Regions. *IATSS Research*, **39**, 102-109. https://doi.org/10.1016/j.iatssr.2016.01.001

[2] Currie, G., Truong, L. and De Gruyter, C. (2018) Regulatory Structures and Their Impact on the Sustainability Performance of Public Transport in World Cities. *Research in Transportation Economics*, **69**, 494-500. https://doi.org/10.1016/j.retrec.2018.02.001

[3] Pojani, D. and Stead, D. (2015) Sustainable Urban Transport in the Developing World: Beyond Megacities. *Sustainability*, **7**, 7784-7805. https://doi.org/10.3390/su7067784

[4] Šipuš, D. and Abramović, B. (2017) The Possibility of Using Public Transport in Rural Area. *Procedia Engineering*, **192**, 788-793. https://doi.org/10.1016/j.proeng.2017.06.136

[5] Rahman, M. (2012) Public Transport in a Small Island of a Developing Country. *Urbe. Revista Brasileira de Gestão Urbana*, **4**, 61-72. https://doi.org/10.1590/S2175-33692012000100005

[6] Rahman, F., Chowdhury, T., Haque, M.M., Rahman, M. and Islam, M. (2015) Analyzing Customer Satisfaction of Bus Service in Dhaka City. *Proceedings of the International Conference on Recent Innovation in Civil Engineering for Sustainable Development* (*IICSD*-2015), Gazipur, 11-13 December 2015, 1-7.

[7] Niger, M. (2013) Deficiencies of Existing Public Transport System and a Proposal for Integrated Hierarchical Transport Network as an Improvement Options: A Case of Dhaka City. *IOSR Journal of Mechanical and Civil Engineering*, **5**, 42-53. https://doi.org/10.9790/1684-0554253

[8] Gakenheimer, R. (1999) Urban Mobility in the Developing World. *Transportation Research Part A*: *Policy and Practice*, **33**, 671-689. https://doi.org/10.1016/S0965-8564(99)00005-1

[9] Sobhani, M.G., Imtiyaz, M.N., Azam, M.S. and Hossain, M. (2020) A Framework

for Analyzing the Competitiveness of Unconventional Modes of Transportation in Developing Cities. *Transportation Research Part A*: *Policy and Practice*, **137**, 504-518. https://doi.org/10.1016/j.tra.2019.02.001

[10] Nguyen-Phuoc, D.Q., Currie, G., De Gruyter, C. and Young, W. (2018) How Do Public Transport Users Adjust Their Travel Behaviour If Public Transport Ceases? A Qualitative Study. *Transportation Research Part F*: *Traffic Psychology and Behaviour*, **54**, 1-14. https://doi.org/10.1016/j.trf.2018.01.009

[11] Simpson, B.J. and Simpson, B. (2003) Urban Public Transport Today. Routledge, London. https://doi.org/10.4324/9780203362235

[12] Barwell, I. (1985) Rural Transport in Developing Countries. Intermediate Technology Development Group Publishing, London. https://doi.org/10.3362/9781780445830.000

[13] Majumder, M. (2020) An Approach to Counting Vehicles from Pre-Recorded Video Using Computer Algorithms. Louisiana State University and Agricultural & Mechanical College, Baton Rouge.

[14] Wilmot, C., Stopher, P., Antipova, A., Gudishala, R., Doulabi, S. and Majumder, M. (2021) ITE Trip Generation Modification Factors for Louisiana. National Academies of Sciences, Engineering, and Medicine, Washington DC.

[15] Wu, Z. and Emtiaz, M. (2022) Quality Management of Cracking Distress Survey in Flexible Pavements Using LTRC Digital Highway Data Vehicle. Louisiana State University, Louisiana Transportation Research Center, Baton Rouge.

[16] Grison, E., Burkhardt, J.-M. and Gyselinck, V. (2017) How Do Users Choose Their Routes in Public Transport? The Effect of Individual Profile and Contextual Factors. *Transportation Research Part F*: *Traffic Psychology and Behaviour*, **51**, 24-37. https://doi.org/10.1016/j.trf.2017.08.011

[17] Dell'Olio, L., Ibeas, A. and Cecin, P. (2011) The Quality of Service Desired by Public Transport Users. *Transport Policy*, **18**, 217-227. https://doi.org/10.1016/j.tranpol.2010.08.005

[18] Emtiaz, M., Imtiyaz, M.N., Majumder, M., Idris, I.I., Mazumder, R. and Rahaman, M.M. (2023) A Comprehensive Literature Review on Polymer-Modified Asphalt Binder. *CivilEng*, **4**, 901-933. https://doi.org/10.3390/civileng4030049

[19] Imtiyaz, M.N. (2022) Estimating Future Crash Rates on Roads in Louisiana. Louisiana State University and Agricultural & Mechanical College, Baton Rouge.

[20] Lucas, K. and Jones, P. (2012) Social Impacts and Equity Issues in Transport: An Introduction. *Journal of Transport Geography*, **21**, 1-3. https://doi.org/10.1016/j.jtrangeo.2012.01.032

[21] Mizan, M.H. and Majumder, M. (2016) Experimental Investigation of Unreinforced and Reinforced Masonry Slab. *Global Journals of Research in Engineering*, **16**, 7-14.

[22] UN (2016) The World's Cities in 2016. 11.

[23] Kabir, M.U., Sakib, S.S., Rahman, I. and Shahin, H.M. (2019) Performance of ANN Model in Predicting the Bearing Capacity of Shallow Foundations. *Proceedings of the Geotechnics for Transportation Infrastructure*: *Recent Developments*, *Upcoming Technologies and New Concepts*, Volume 2, 695-703. https://doi.org/10.1007/978-981-13-6713-7_55

[24] Bank, W. (1996) Development in Practice: Sustainable Transport. Washington DC.

[25] Mahdi, M., Sobhani, M., G., Wu, Z., Liu, Y. and Xie, Z. (2022) Development of a Fatigue Damage Model for Roller Compacted Concrete Pavement Based on *in Situ* Saw-Cut Beams and Accelerated Pavement Performance. *Transportation Research*

Record, **2676**, 279-290. https://doi.org/10.1177/03611981221089314

[26] Majumder, M. and Wilmot, C. (2023) Automated Vehicle Counting from Pre-Recorded Video Using You Only Look Once (YOLO) Object Detection Model. *Journal of Imaging*, **9**, Article No. 131. https://doi.org/10.3390/jimaging9070131

[27] STP (2004) Strategic Transport Plan (STP) for Dhaka, Final Report, 2006.

[28] Report, B. Bangladesh Road Transport Authority. https://www.brta.gov.bd

[29] Akter, C., Ahmed, S. and Shobhan, R. (2015) Customers' Satisfaction in Bus Service Quality of Dhaka City. *Proceedings of the International Conference on Recent Innovation in Civil Engineering for Sustainable Development*, Gazipur, 15-17 June 2015, 1-7.

[30] Rahman, M. (2007) Determining Appropriate Public Transport System Given the Level of Development/Urbanization: The Case of Siquijor Province, the Philippines. *Proceedings of the* 11*th World Conference on Transport Research*, Berkeley, 24-28 June 2007, 33 p.

[31] Emtiaz, M. (2020) Quality Assessment of Flexible Pavement Automated Cracking Data in Louisiana. Louisiana State University and Agricultural & Mechanical College, Baton Rouge.

[32] Ahmed, I., Alam, N. and Warda, F. (2017) A Sustainable Urban Transport Initiative in Dhaka: Introducing Bus Rapid Transit System. *UNESCAP*: *Transport and Communications Bulletin for Asia and the Pacific*, **87**, 67-87.

[33] Triantaphyllou, E. and Lin, C.-T. (1996) Development and Evaluation of Five Fuzzy Multiattribute Decision-Making Methods. *International Journal of Approximate Reasoning*, **14**, 281-310. https://doi.org/10.1016/0888-613X(95)00119-2

[34] Hoque, T., Rashid, M.H. and Majumder, M. (2014) Performance of Stone Dust as Partially Replacing Material of Binding Material and Fine Aggregate on Strength Properties of Mortar. *Proceedings of the* 2*nd International Conference on Civil Engineering for Sustainable Development* (*ICCESD*-2014), Khulna, 14-16 February 2014, 941-949.

[35] Zopounidis, C. and Doumpos, M. (2002) Multicriteria Classification and Sorting Methods: A Literature Review. *European Journal of Operational Research*, **138**, 229-246. https://doi.org/10.1016/S0377-2217(01)00243-0

[36] Saaty, T.L. (1988) What Is the Analytic Hierarchy Process? Springer, Berlin Heidelberg, 109-121.