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A Review of Identification of Impact Factors for Evaluation of Impact of Bus Transport Service in a City

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Abstract: *The bus transport service is the primary mode of transportation services which is increasingly adopted for many purposes, such as providing mass mobility, managing traffic congestion, mitigation air pollution, reducing energy consumption and creating development opportunities in the city. However, most Indian cities faces higher travel cost, higher traffic congestion and unreliable service, thereby creating economic loss and environmental degradation. Hence the various issues causing inefficient operation of bus transport services needs to be resolving by appropriate techniques and measures. Therefore there is an urgent need to develop a methodology for evaluating the impact of bus transport services in Indian cities. Thus this study presents a hierarchical structure for identification of bus impact factors for evaluating the impact of bus transport service in Indian cities. Bus impact factors are supervision tool which gives a clear indication of how well it is providing transit services to the public. This study also proposed a methodology to evaluate the impact of identified performance indicators. It is expected that this study will be useful to evaluate the impact of bus transport service and also useful to improve the performance of bus transport service in Indian cities.*

Keywords: *Bus transport service, Bus impact factors, Hierarchical structure*

I. INTRODUCTION

India has the largest public transport system in the world. The bus transport services are the major mode of public transport system which improves the quality of life by providing safe, efficient, and economic transportation. Bus transport service has been used to provide mobility to people without access to private modes of transportation. Nowadays, bus transport services in most of the Indian cities are rapidly deteriorating because of the increasing travel demand and inefficient transportation system which results in increase of travel cost, traffic congestion, and unreliable services, thereby creating economic loss and environmental degradation. Thus there is a great need to ensure that the bus transport services are safe, efficient, affordable and effective. Bus transport services are most commonly used for providing mass mobility, managing traffic congestion, mitigation air pollution, reducing energy consumption and creating development opportunities in cities. Therefore, many researchers focused on improving bus transport services to improve environment in Indian cities by shifting mobility from private mode of transport towards more efficient environmental friendly and safe travel modes. However, improvement of performance of bus transport services is a difficult task which is affected by various factors such as social, economical, environmental, travel pattern and political factors. Thus it is necessary to evaluate the impact of existing bus transport services in a city to know how well it is providing transit service to the public in the area served and provides valuable information based on which important operating decisions can be taken for implementing new bus transport service in Indian cities.

Therefore there is an urgent need to develop a more rational methodology for evaluating the impact of bus transport services in Indian cities. Bus impact factors are management tool which gives a clear indication of how well it is providing transit services so that the selection of bus impact factors is a very important task. The selection of most appropriate performance indicator is a rigorous process because a large no. of bus impact factors approximate 500 (NCHRP report 446) are available. Therefore, the objective of this study is to develop a hierarchical structure to identify factors and methodology for evaluating the impact of bus transport services in Indian cities.

This paper contains five sections among which this is the first one. This section presents problem statement; need and objective of the study. The second section briefly explains the literature review and research need. Third section presents hierarchical structure for identification of performance indicators. Fourth section presents a methodology for evaluating the identified indicators. The last section discusses important conclusions drawn from this study.

II. LITERATURE REVIEW ON IMPACT OF BUS TRANSPORT SERVICE IN A CITY

Literature review is carried out on various aspects of evaluating the impacts of bus transport service in a city. Ministry of Urban Development (MoUD), Government of India (2009) simply identified the six city wide bus impact factors of bus transport service which are presence of bus transport service, extent of supply availability of bus transport service, service coverage, average waiting time, level of comfort and % fleet as per urban bus specification. The six identified performance indicators are selected on a generalized basis. Jaiswal A et al., studied the performance of bus transport system in Ahmadabad's city.¹ They evaluated the impact of bus rapid Transport service in Ahmadabad's city before and after implementation of bus rapid Transport service by considering the identified factors and they are traffic impacts, social impacts and environmental impacts. Kittelson et al., "Assess the impact of transit services on such quality of- life issues as mobility, job access, vehicle trip reduction, personal finances, property values, and pollution.⁵ Mahmoud et al. said that there is a wide range of bus impact factors available in literature so the selection of appropriate factors is a complicated task.³ Therefore there is an urgent need to develop a hierarchical structure for identification of most appropriate bus impact factors for evaluating the impact of bus transport services in a city.

A. Development of a Hierarchical Structure for Identification of Bus Impact Factors

The main objective of this study is to develop a hierarchical structure for identification of bus impact factors for evaluating the impact of bus transport services in Indian cities. A hierarchical structure to identify the bus impact factors are presented in Figure 1.

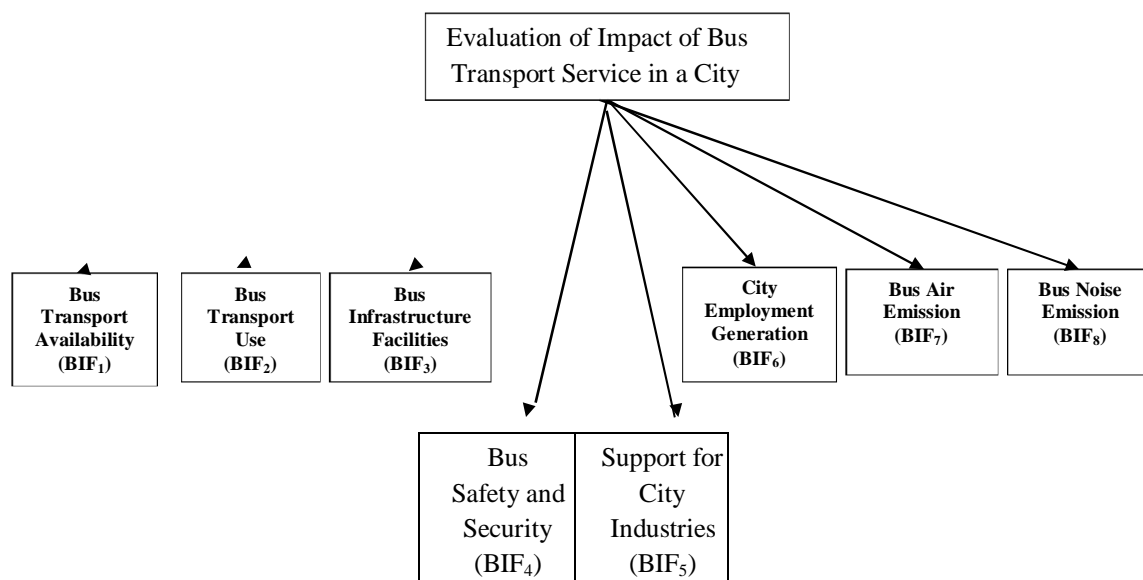


Figure 1.A Hierarchical Structure for Identification of Bus Impact Factors

From a hierarchical structure total eight bus impact factors are identified for evaluation of impact of bus transport service in a city. These are bus transport availability (BIF1), bus transport use (BIF), bus infrastructure facility (BIF), busA Methodology for Evaluation of Identified Bus Impact Factors

Bus impact factors are the powerful tools which reveal safety and security (BIF), support for city industry (BIF), information about certain characteristics of a bus transport employment generation (BIF), bus air emission (BIF), and service which is used to monitoring and improving the bus noise emission (BIF8).

These impact factors are used to evaluate the impact of bus transport service in a city. existing bus transport service. Hence this study presents a methodology for evaluation of Identified Bus Impact Factors to evaluate the impact of bus transport se in a city regarding various city aspects. As per the hierarchical structure the impact of bus transport service can be evaluated in terms of bus availability, bus use, bus infrastructure facility, bus safety and security, support for city industry, employment generation bus air emission and bus noise emission. Table 1 presents a methodology to evaluate condition of identified bus impact factors for overall evaluation of impact of bus transport service in a city.

Table 1. Methodology for Evaluation of Bus Impact Factors

S. No	Notation	Performance Indicators	Methodology for Evaluating Impact
1	BIF ₁	Bus Availability Index (BAI)	BAI=TPV/TCP TPV= Total No. of Bus in the City in Thousands TCP= Total City Population in lakhs
2	BIF ₂	Bus Use Index (BUI)	BUI=TNP/TCP TNP=Total no. of passenger used the bus service TNP=Total city population
3	BIF ₃	Bus Infrastructure Facility Index (BIFI)	BIFI=User Rating between 0 to 1 User rating vary from Very Poor Infrastructure Facility (0) to Extremely Infrastructure Facility (1)
4	BIF ₄	Bus Safety and Security Index (BSSI)	BSSI=BSD/TBC BSD=No. of Buses equipped with Safety Devices TBC= Total No. of Bus in the City
5	BIF ₅	Support for City Industries Index (SCII)	SCII=User Rating between 0 to 1 User rating vary from Very Poor support (0) to Extremely support (1)
6	BIF ₆	Employment Generation Index (EMGI)	EMGI=(JPT×100)/TJC JPT=Jobs Created by Particular Bus in the City TJC= Total Jobs Created by Total Bus in the City
7	BIF ₇	Bus Air Emission Index (BAEI)	BAEI=TAE/TNV TAE=Total Air Emission in the City TNV=Total No. of Bus in the City
8	BIF ₈	Bus Noise Emission Index (BNEI)	BNEI=User Rating between 0 to 1 User rating vary from Very low noise emission (0) to Extremely Noise emission (1)

III. CONCLUSIONS

The main objective of this study work is to develop a transport availability (BIF1), bus transport use (BIF2), bus infrastructure facility (BIF3), bus safety and security (BIF), support for city industry (BIF), employment hierarchical structure for identification of bus impact generation (BIF), bus air emission (BIF), and bus factors for evaluating the impact of bus transport service in Indian cities. Some conclusions drawn from this study are as follows.

- It is necessary to evaluate the impact of existing bus transport services in a city to how well it is providing transport service to the public in the area served, and provides valuable information based on which important operating decisions can be taken for implementing the new bus transport service for Indian cities. Therefore there is an urgent need to evaluating the impact of bus transport service in a city.
- A critical literature review indicated that there is limited rational methodology for evaluating the impact of bus transport service in Indian cities. Further, the selection of most concise set of bus impact factors is a challengeable task due to the large number of factors present Therefore there is urgent need to develop a hierarchical structure for identification of most appropriate bus impact factors.
- This study identified eight bus impact factors i.e. bus noise emission (BIF8). This study presents a hierarchical structure for identification of performance indicators for evaluating the impact of bus transport service in Indian cities.
- This study also proposes a methodology to evaluate the identified bus impact factors for quantify the impact of bus transport services in Indian cities.

It is expected that this study will be useful to evaluate the impact of bus transport service in Indian cities.

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