

Need of Smart Transportation for Transforming Indian Cities – State of the Art

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Abstract

In the approach to the smart city mission, the objective is to promote cities that provide core infrastructure and give a decent quality of life, a clean and sustainable environment and application of 'smart' solutions. Smart transportation system is sentient soul of the smart city. During development of a smart city one of the most important aspect include effective transport system is to make the existing transportation system of a city smarter. For this modern means of transport must be included in the planning of smart city. While planning efforts must be directed to make the transportation system swift, efficient, cost effective and acceptable to the citizens of the city. The present paper discusses about the various means of transport which might be adoptable while planning for a smart city. Smart Transportation technologies include state of the art with a goal to improve surface transportation safety, efficiency, and convenience.

Keywords: - Sky bus, Metrino, Monorail, Metro rail, ITS.

INTRODUCTION

With increasing pressure on cities' mobility infrastructures due to rising urbanization, city governments all over the world are constructing new roads, bridges and tunnels, and using intelligent transportation systems (ITS), to mitigate

transportation-related challenges and requirements. However, ITS implementation is costly as different technologies, platforms, and systems need to integrate into a single platform. Cyber security, data analysis, and connectivity will be critical to ITS success. Cities are

engines of growth for the economy of every nation, including India. Nearly 31% of India's current population lives in urban area and contributes 63% of India's GDP. With increasing urbanization, urban areas are expected to house 40% of India's population and contribute 75% of India's GDP by 2030. This requires comprehensive development of physical, institutional, social and economic infrastructure. A picture of smart city contains a wish list of infrastructure and services that describes their level of aspiration. To provide for the aspiration and needs of the citizens, urban planner ideally aims at developing the entire urban eco-system. Efficient transportation system is considered as key feature in making the city 'smart'. The people residing in smart city will have a desire to have a public transport system which will

be reliable, efficient, economical, eco friendly and safe. For providing such transport system, the provisions related with availability of land, road width, road network and financial resources must be made during planning of smart city. Also the constraints related with non-adoptability of transport system by the people, narrow road width, congested localities, pay capacity of passengers, crowd of passengers, slack hours of traffic must be given thoughtful implementation. To cope up the need of smart city, various intelligent transport systems might be thought for operation within city. Transport systems and city character are interlinked. Land use characteristics of a city can determine the type of transport system, it needs. Smart transportation can be ushered in through improvements in four major areas:

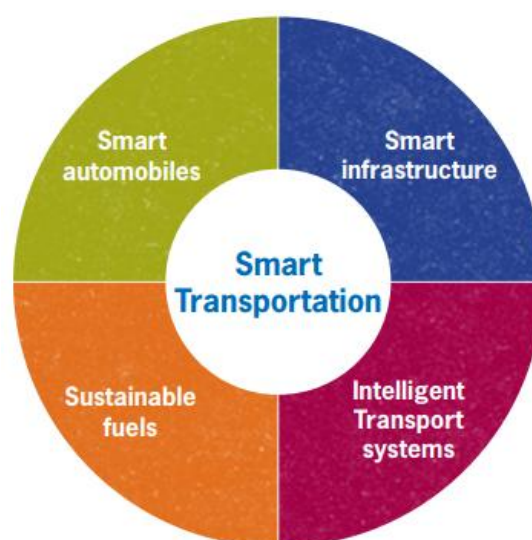


Figure 1 Four major areas of smart transportation

TRANSPORT SYSTEMS

The transport system to be adopted for a smart city need to be designed smarter which will be adoptive, efficient and economical. Hence the transport system to be introduced for a smart city might be characterized under following categories.

1. Bulk public Transport System
2. Semi bulk Public Transport System
3. Non bulk Public Transport System

Bulk Public Transport System

With increase in population and requirement of communication means, a bulk public transport system is considered to be effective way of communication. The main motive of bulk public transport system is to provide best transportation system to citizens through the improvement in existing means of transport as listed below

1. Local train
2. Metro rail
3. Mono rail

Local train

As the existing local train system complies with demand of transportation, it somewhere lags the efficiency and safety. As such great amount of improvement sophistication is required to the existing

system to make it smarter which will cope up the need of a smart city. As employment being the major factor for the migration of people in city, its bulk transportation is the unit under constant load. Hence transportation of large population entering and leaving the city can be achieved by introducing smart and improved local train routing and installation. As large number of population is to be handled their frequency plays an important role. Other factors such as flexibility ease of access to the station from business point, capacity, speed of transportation, comfort and safety of passenger is to be kept under minute consideration.

Local trains are to be built with proper seating and standing arrangement along with supportive ventilation. Electronically developed doors, signal system, train scheduling and announcement and informatory boards should be provided. Routing and laying of tracks for connecting various location should be well optimized along with traffic management. The local station must be equipped with lifts, escalators, air conditioned waiting rooms, automatic ticket vending machine along with provision of route guiding monitors will add to its smartness.

Metro rail

Smart city consist of various business point and connecting them is a major task which is to be brought up by installation of metro rail. It is an effective mode of transportation for travelling distances within the city and connecting suburbs. Metro rail usually runs on laid tracks specially meant for metro rails while local train tracks may be shared by freight trains or other long distance train which basically distinguishes both. Having its independent track metro rail have to handle local crowd hence various safety measures and facilities are to be provided.

These facilities include electronically operated regulatory information and various instruments including ticket machines from first aid safety and emergency exit and evacuation are to be implemented. Metro rail may be constructed on surface, underground or bridge stayed depending on the feasibility and requirement.

Strategic placement of stations and routes should be done in order that it connects almost every major business area. Thus this implies the suitability and adoptability of metro rail means of transport as smarter means of transportation for a smart city.

(See Figure2)



Figure 2 Local train

Monorail

Monorail is a single rail serving as a track for passenger or freight vehicles. In most cases rail is elevated, but monorails can also run at grade, below grade or in subway tunnels. Vehicles are either suspended from or straddle a narrow guide way. Monorail vehicles are WIDER than the guide way that supports them. Chiba urban (monorail world's largest monorail) established in 1979 and began service in 1988. Monorail carries 7,500 passengers per hour per direction and has the capacity to carry 1.5 to 2 lakhs passengers daily. Many parts of the city which are not connected by suburban rail system or metro rail can be connected by monorail. Monorail will be an efficient feeder transit system benefiting passengers and will offer efficient, safe, air-conditioned, comfortable and affordable public transport system. As such monorail can be one of the best options to be adopted for implementation for a 'smart city'. ***(See***

Figure3)



Figure 3 Monorail

Semi Bulk Public Transport System

1. Sky Bus Service
2. City Bus Service

Public transport stations must be close to origin and destination of commuters preferably within 500 m of both home and work place. Only road based systems can do this. Rail based systems, on an average; usually add another 200-300m of walking inside stations including staircases.

This reduces the acceptance of rail based systems compared to surface bus systems especially for children, the elderly, health impaired (heart disease, arthritis, etc.) and the physically disabled. As such a semi bulk public transport system may be acceptable to the majority public because of its convenience. Semi bulk transport system includes sky bus transportation, city bus transportation, etc.

Sky Bus

Sky bus is one of the modern sophisticated means of transport which suits the need of modern people with due consideration to environmental protection. Sky bus is a greener way to travel. When delegates choose to travel on Sky bus between the Airport and the city they all leave a smaller carbon footprint.

Sky bus supports Green fleet and plants over 7,000 trees each year to offset carbon emissions from its fleet's fuel consumption. Sky Bus operates 24 hours/7 days a week- over 250 trips a day moving in excess of two million passengers. It can be also known as suspended railway. First Sky bus was open at Cheshunt on 25th June 1825.



Figure 4 Sky Bus

City Bus Service

Effective operation of urban bus system is vital for the development of any city. There is a widespread reliance on public transport for providing mobility within urban areas throughout the world. However, in most Indian cities, there is an ever increasing preference towards use of personal vehicles for commuting due to the absence of a robust public transport service which in turn is leading to the problems of road congestion, pollution, lack of safety leading to increasing number of road fatalities.

Thus, there is an immediate need to improve the performance of bus system to retain the existing passengers and to discourage the use of private vehicles. Buses can operate over existing roadway facilities at a much lower cost per passenger. Furthermore, buses provide the greatest flexibility in service routes to

meet the current transport demand. Thus, improved performance of urban bus service could essentially contribute to improved environmental conditions in medium sized cities by shifting mobility from private modes towards more efficient environmental-friendly and safer travel modes. Performance of a bus system is affected by several criteria such as the fleet strength, the quality and frequency of service last mile connectivity and change of land uses etc.

Therefore, various issues contributing to inefficient operation of bus services need to be identified and appropriate techniques /measures should be formulated to resolve these issues. GOI in April 2006 announced a National Urban Transport Policy (NUTP). The policy focuses on the need to “move people – not vehicles” and ensure safe, affordable, quick, comfortable, reliable and sustainable access for the

growing number of city residents. The emphasis is on encouraging greater use of public transport, establishing effective regulatory, institutional and enforcement mechanisms, and improve planning and management of transport systems. In 2005, Ministry of Urban Development, MoUD, and Government of India (GOI) launched the Jawaharlal Nehru National Urban Renewal Mission (JNNURM).

The Mission was launched with an aim to encourage urban level reforms and fast track planned infrastructure development of identified “mission cities”. Public transport systems have not been able to keep pace with the rapid increase in demand over the past few decades. Bus services in particular have deteriorated and passengers have turned to personalized modes and intermediate public transport (IPT) (such as auto rickshaws, jeeps, taxi, tempos, mini buses etc.), adding to traffic congestion which impacted on bus operations to a large extent.

Till the launch of the Scheme, very few cities had given emphasis to reforming their operations of bus services in urban areas. While some cities like those in Uttar Pradesh and Andhra Pradesh etc. still had their STUs operating urban bus services, others like Mumbai and Pune had

city specific transport undertakings running bus operations. Indore took the lead of setting up a Special Purpose Vehicle, for city bus operations, encompassing the Municipal Corporation, Development Authority and franchising bus operations to private partners. A unique partnership thus emerged which ensured good quality, high efficiency and sustained public services.

NON BULK PUBLIC TRANSPORT SYSTEM

Usually such a transport system does not deal with large crowd handling but it plays a strategic importance in carrying passengers through routes such as hilly area in case of metrino and small congested area in case of taxi. Hence planning a good non bulk public transport is of outmost importance for having a smart approach.

Metrino

Metrino transport system (formerly known as MISTER- “Metropolitan Individual System of Transportation on an Elevated Rail) is a personal rapid transit (PRT) system developed in Poland. It belongs to the group of PRT systems using a carriage suspended by a rail, mounted so its bottom is approximately six meters above the ground. In October 2014 MISTER change

its name to “Metrino PRT”. Travelling speed may increase up to 50km/hr. as it is not surface or corridor based its distribution capacity is surely better than any other system. Hence metrino transport system will be a smart approach. The infrastructure required for this transport system is comparatively less. Electricity is directly use in this system. As weight of vehicle is less, the energy consumption is less as compared to another system. There is no requirement of additional maintenance such as filling pot holes, surface coating which is required in conventional transportation system. So no additional maintenance cost is required. This transport system provides user personal safety from pick-pockets, attacks etc. as individual trips directly to your destination are possible. As there is separate track for pod in a direction there is no chance of collision. Plus it is computer operated system less chances of accidents with maximum safety as most of the accidents occur due to human errors. Anti- flooding characteristics, as it operates 6+ meters above the ground. As it is elevated one system, and no friction in track and vehicle this system provides us smooth journey. Comfort with climate control, information system and multimedia entertainment. And for handicapped person, senior citizen, and

small kinds this system is comfortable and useful. 100% accessible at stops for wheelchair and mothers with push chairs. This system provides us personal car convenient journey. So it may result into reduction of car based transportation system reducing traffic congestion. It is not corridor based (like metro), and surface based (like buses), so it is all whether resistant, with anti- flooding characteristics. There will be major reduction of air pollution, noise (small electrics motors, no exhausts, no oils or tires). Along with the above benefits this system can provide us secondary benefits such as major reduction of real estate demands for infrastructure, major reduction cost and time of infrastructure development (even along inner city roads), individual and direct travel between starting and destination points – no queuing, no delays and no congestion, higher distribution capacity as compared to metro, bus system. (See Figure 5)

New Zealand’s Metrino Personal Rapid Transit, one of the three international front runners chosen for India’s first pod taxi project—has decided to withdraw and called off its joint venture with an Indian partner it declined to name.



Figure 5 Metrino

Taxi Cabs

The problem of congestion and its consequences in the form of travel delays, loss of productivity, deterioration in the quality of air, noise pollution and mounting number of road fatalities are the debilitating downsides of life in the urban areas. Non-motorized mode of transport seems to have lost its earlier importance in the larger metropolises. The increased consumption of fossil fuels also has adverse impact on the energy security of the nation.(See Figure:-6)

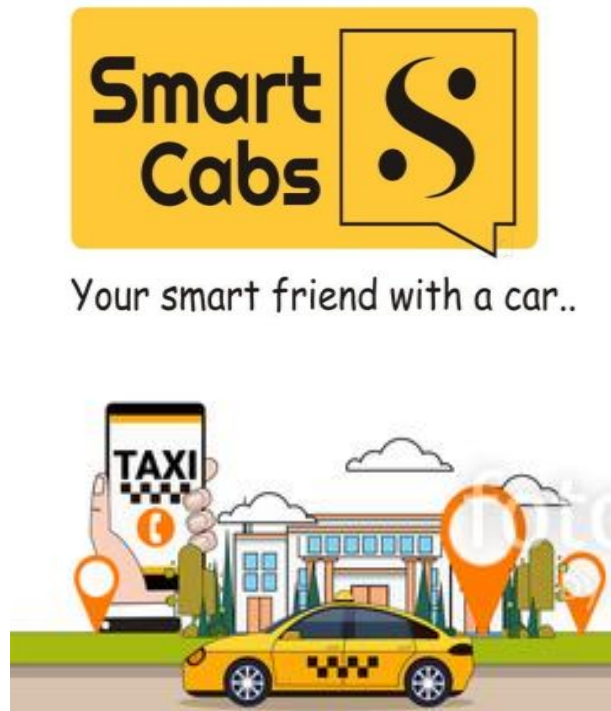


Figure:-6 Smart Taxi Cabs Service

However owing to the convenience, self-esteem, comfort, status symbol and privacy requirement use of taxi cab can't be neglected as such efforts must be directed to make the taxi cab service most reliable, economical, comfortable and at most secured. Taxi cab being the only means of transport which fulfil the need of public for its origin to destination requirements is always at supreme. **(See Table:-1)**

Compare with other modes of public transport usually receive subsidies for operation or infrastructure or both, but taxis are fully financed by users. Taxis provide high flexibility and convenience for low transport volumes at high costs.

CONCLUDING REMARKS

This can be a long term goal and cities can work towards developing such comprehensive infrastructure

incrementally, adding on layer of smartness. Once a smart transport system is put in place, it influences land use characteristics of the city over time. Therefore, the type of public transport system will depend on the future vision.

The innovative approach proposed in this article is capable of transforming the existing transportation system radically having turned it into a highly intelligent environment. It will not only bring mortality and injury rate on roads to nothing but will also increase social mobility, improve environmental situation; it will also give impulse to development of new services in different fields.

Successful urban transport systems not only increase commercial and labour market efficiency, but also increase access to amenities, improve general mobility and add to quality of life.

Table 1 Comparison of various modes of public transport

	Capacity	Trip	Time Required for	Cost of Service	Flexibility
Rail	High	5 km +	Years	Very high	Low
Metro	High	5 km +	Years	Very high	Low
Buses	Medium	500 m +	Hours / Days	High	Medium
Sky	Medium	1 km +	Hours / Days	High	Medium
Taxis	Low	0 +	Minutes	Low	High

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