

Multimodal Transport Solutions for Smart Cities

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Abstract

The research article has shown the multimodal transport solutions for smart cities in India. The researcher has discussed the concept of multimodal transport solution, problems and also characteristics for the solution of multimodal transport systems in the smart cities. The main findings are to show that the multimodal system has the capacity to overcome the issues of smart cities. It also has power to mitigate traffic issues which take place that take place in different cities. The system develops the product delivery times, reduces many inventory costs and also keeps the shipment costs under control.

Keywords

communication technology, Multimodal transport solution, Smart cities.

INTRODUCTION

Smart cities use modern communication technology and information to share operational information of the world or a country, to improve efficiency with the people. The research has been revolving around multimodal transport and multimodal transport solutions in the transport industry within smart cities. Multimodal smart systems include railway, roadway, waterway and airway which create a solution for travel. The environmental footprint in the transport industry has been reduced through the multimodal transport system.

Rationale

Now-a-days, many smart cities in India have faced many problems of *vehicles sprawling, levels of overcrowding, time losses, high levels of pollution* and others. India's smart cities are wanting to revise the policies of transportation for economic activities. The increasing amount of *ineffective transportation, housing development issues, excessive fuel consumption* and also *high pollution levels* are the most important concerns for the smart cities in India [8]. Multimodal transport solutions systems for the smart cities, the government and also policy makers plan integrated transport systems and also land use.

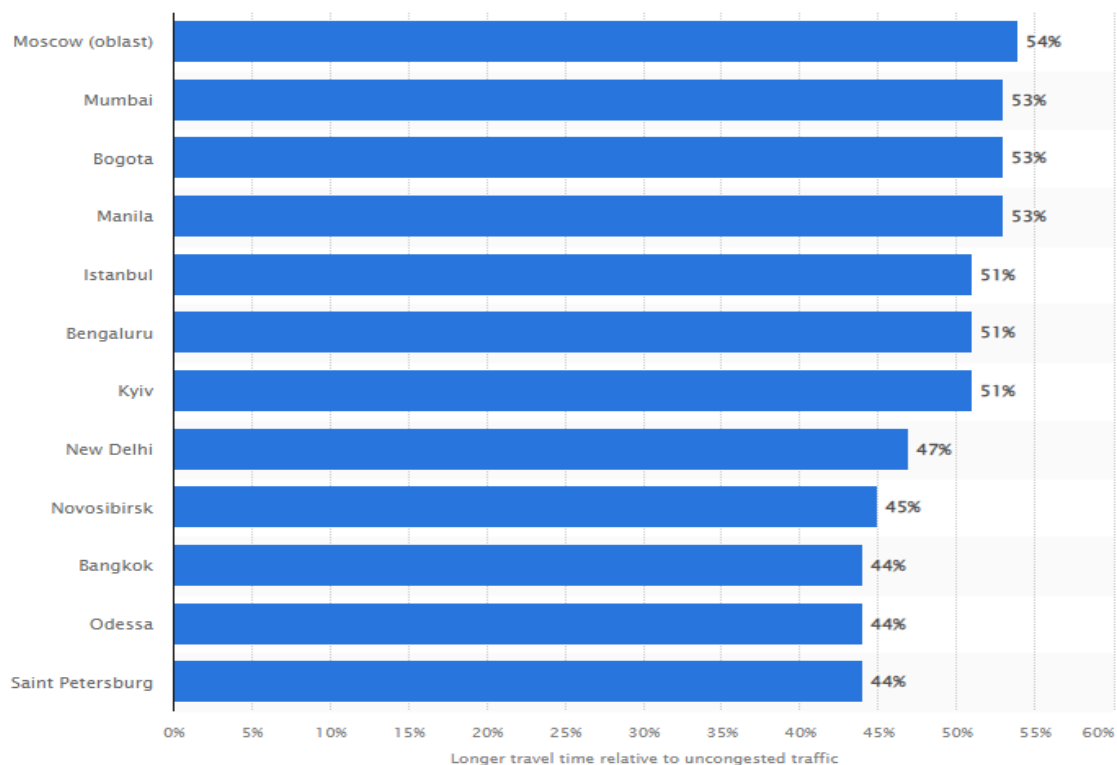


Figure 1: Traffic prone smart cities of 2020 [9]

The above image has shown that **54% traffic prone places have been congested in Mumbai, 51% of traffic prone areas in Bengaluru and 47% traffic prone locations have been seen in New Delhi** [9]. Real travel times are longer than under free-flow conditions and make the cities most congested in the whole world. In India, as a smartest city Bhubaneswar is facing the problems of using a multimodal transport system. The masses of **Bhubaneswar** give less response towards the bus services. There are nearly **14000 buses across the state, around 40% of buses are running in some districts during Covid19** [12]. There is only one mode of transportation that is through buses and no other transports that are causing issues in public transport and goods delivery in the city.

On the other hand, in **Pune** another smart city has faced the problems of delivery by Amazon. **Delivery persons of Amazon** have called on strike to fulfil individual commands of commission, insurance, salary and others [7]. In Pune, many product delivery companies are dependent on a multimodal transport system for ensuring delivery of services and goods [11]. As Pune has been named as a **fifth congested city**, the increasing dependency on transport by the organisation has been an issue.

Aim and objectives

The research aims to analyse the use of multimodal transport solutions for smart cities. The research objectives are as follows:

- To understand the concept of multimodal transport
- To discuss multimodal transport solution's characteristics for the smart cities
- To identify and evaluate multimodal transport solution's problem for the smart cities in India

LITERATURE REVIEW

Overview of multimodal transport solution

Multimodal transport is known as **combined transport** that is the transportation of various goods by the help of a single contract, where the system is performed through two or many different modes of transport such as **road, sea, air** and others. [5] opined that transport is responsible for the **entire transport of the business** as the operator of the multimodal transport. The multimodal transport enhances transportation mode, where the vehicle has taken the goods to the final destination through using **either trains, trucks, aeroplanes, or ships** to facilitate **cargo movement** for goods delivery. Multimodal transport has evolved in relation to the **container revolution** and the **transport system is essential for the smart cities** to carry on business. The transport system has assured the buyer and supplier that the company's goods will be effectively supplied and also managed through a **mixed transport means**. In the year 1960, Indian railways played an important role in promoting multimodal transport in India.

Characteristics of multimodal transport solution

In the present-day context, the multimodal system is very

important for smart cities. [3] mentioned that the transport system offers many businesses and customers to search for a shipping company, which helps to select the right transport mode for continuing the business. In India, the multimodal transport for the smart cities has many advantages, the main advantages of multimodal transport are **reducing congestion, less effort and time, transport security increasement, easier goods tracking, reduction of cost** and others.

The multimodal solution ensures use of a communication system where **Traffic Management systems (TMS)** have been an effective integrated application involving **processing and communication of different information** including **statistical information** to reduce **traffic congestion**. Sensing along with communication through TMS technologies has capability to provide warnings to drivers. [2] argued that the transport system has served through sea, air, and also a car carrier. The operator of multimodal transport has taken a big responsibility for the completeness, damage, transported goods and also related transport problems. By using the transport system, many operators have delivered their company's product for low cost by taking less time.

Problems of multimodal transport solution for smart cities

In India, many smart cities have faced problems in the development of multimodal transport. The problems are **lack of railway infrastructure, railway connectivity network, lack of clear rules and regulations** and also **lack of information and communication technology** usage level that support the participation of service providers. In the case of using the multimodal transport system that has many disadvantages. The Imposition of **operational and legal barriers** where rules and regulations are applied over the system during exporting containers from one city to another. On the other hand, for safety purposes, **terminal investigations** can be the biggest issue of multimodal transport solutions for smart cities as there is a huge amount of containers which cannot be exported through aircraft.

The other problems are the emergence of **new technologies** that have been developed in the various cities of transport and aligning those technologies with multimodal solutions can be challenging in the transport industry. [10] argued that at roads or stations, the operator has inspected the process of **high requirements** of employees to make sure about the security process. In India, many companies such as Amazon, Flipkart and others have faced issues by using the transport system such as **security risk, material theft, lack of effective infrastructure, poor information and communication level, lack of integration between the patterns of network, lack of employees** and others.

METHODOLOGY

Through the internet platforms, **crowdsourcing** is a method to get new and modern ideas from a group of people. The method mainly depends on innovativeness and also the quality of ideas. It is also known as a **model of web-based**

business to increase innovative solutions. In this process, the appropriate involvement and also targeting the participants plays an important role. As per the view of [6], crowdsourcing has been used in public administration, journalism, medicine, social science research and also used for urban planning. In this research study, the sample has produced local knowledge and opinion's diversity to produce important collective decisions over identified issues such as pollution, traffic and others. In this process, the research has asked open ended questions linked to the multimodal transport system and the systems improvements into the mentioned systems. The *uniform resource locator (URL)* was distributed on the *public forums, blogging sites and also social media*. For creative production, in this research study, the crowd has two types of methods such as social production and also an individual's type that was competent. For the smart cities, a large number of innovative ideas or creativity has been received over the smart transport system.

FINDINGS AND DISCUSSION

Smart Transport System through multimodal solution

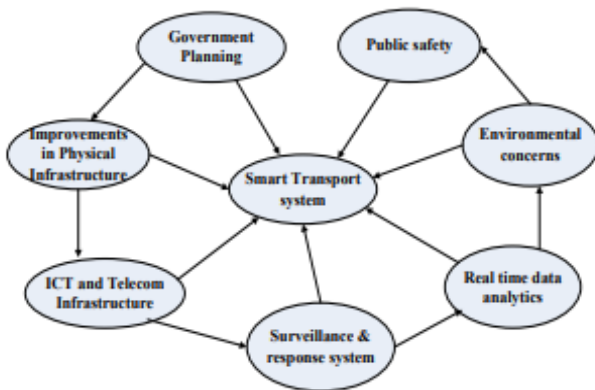


Figure 2: Smart transport system as proposed solution [6]

In this above picture, the researcher has shown that the planning of the government is essential for creating the smart transportation format for any city of the world. The proper financial support and also land-use will improve the physical infrastructure for the system of multimodal transport. *Smart multimodal transport systems* are also related to factors such as government planning, public safety, real time data analytics, surveillance and response systems and others. For improving the transport system, it is necessary to improve various physical infrastructure such as *guidelines of driving lane, parking direction and space system on the road, signs of dynamic digital messages, and system of road weather information* and also *well connecting the ways of trains-roads-air-water* [6]. The government has taken many crowd sourced solutions such as *local and corridor area planning, master plan for multimodal transport, cost-effective services of the multimodal system* and others.

On the other hand, telecom and information and control technology (ICT) infrastructure are the important factors for

improving the multimodal transport system. There are some elements to improve the multimodal transport, such as *virtual street symbols, security cameras setting, wireless connectivity, payment through smart card, network coverage increasement, using mobile apps, web-based applications and transport e-information, real time congestion and traffic information* and others. In this research study, the researcher has looked over the various elements such as *assurance of road safety, automated warning and alarm system, GPS (Global Positioning System) enabled police teams, put panic buttons on the public places, put sensors on the vehicles to avoid any type of accident* and others [6]. Public safety is the first priority on the transportation of multimodal systems.

Mode of Transport	Passenger (Passenger kilometre, PKM)	Freight (Tonne Kilometre, TKM)
Road	86.1%	66.4%
Rail	12.6%	33.3%
Air	1.3%	0.1%
Water	N.A.	0.2%

Figure 3: Different transport modes [1]

Global outlook towards multimodal transport

In the whole world, public transport as well as multimodal transport is considered as a key element to reduce *traffic overcrowding* and also *promote environment friendly models of transportation*. The above table shows the amount of freight, who have used different transport such as rail, road, air, water. 66.4 % of freight has used road while others have availed rail, air and others [1]. The world's various smart cities such as *Paris, Boston, Germany* and others have developed the modern transport system. Paris has redeveloped the existing system of transport. The country has promoted a transport system such as *emergence of a common culture on intermunicipal and urban travel, the territory's development-controlled system*.

With these elements, many policies have been devised to ensure important actions of the networks of transport and also increased the amount of publicly accessible spaces. The strategy has looked at a planned system of transport networks and also the expressway and railway networks has provided effective conveyance on an urban scale [1]. The elements in the context of global outlooks respect the process of multimodal transport such as *access the transit stations by developing infrastructure equipping within the districts and also access the transit stations, to keep the travellers informed with the current information* and others.

On the other hand, in Germany, the success of the transport system is due to the multimodal transportation through coordination of the services of *public transport, schedules* and also *fare* through the metropolitan cities of the mentioned country [4]. The planning is that it holds together public

transport, giving extra importance to the individuals using the multimodal system. The mentioned country is a better example of car-restriction regulations through the multimodal and sustainable transport means. In the smart city, Boston, individuals have realised the importance of multimodal transport and also has provided the future expansions which allows goods, services and residents to remain immensely mobile.

CONCLUSION

The above study has focused on the multimodal transport solutions for the smart cities in the whole world as well as India and other countries. In this study, the researcher has shown the usefulness of various modes of transport such as airways, waterways, railways and also roadways. The researcher has evaluated the concept of smart transport system and also the global outlook towards multimodal transport.

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