ISSN: 0975-833X

Available online at http://www.journalcra.com

International Journal of Current Research
Vol. 9, Issue, 05, pp.49788-49791, May, 2017

INTERNATIONAL JOURNAL OF CURRENT RESEARCH

RESEARCH ARTICLE

MANAGING PASSENGER LOGISTICS: THE DELHI METRO WAY

[1,*]Siddharth Bhatt and [2]Farhat Fatima

[1]Research Analyst, eTouch Systems India Pvt. Ltd.
[2]Assistant Professor, Periyar Management and Computer College, GGSIPU

ARTICLE INFO

Article History:
Received 10th February, 2017
Received in revised form
15th March, 2017
Accepted 04th April, 2017
Published online 19th May, 2017

Key words:

Passenger Logistics,
Delhi Metro,
Operations and Ridership

ABSTRACT

Humans have developed themselves in every aspect. Right from the discovery of fire to reaching the outer space, they have proved their worth for the mankind. They knew how to reach at every possible place. The discovery of wheels did give them the advantage to transportation of every possible thing, from crops to humans. They came to know the importance of transportation as a feasible way to transport things from one place to another. Gradually and gradually, they started inventing different modes of transport for their betterment since they wanted to reach within less time. Now a new term has been coined for transportation of humans. That is passenger logistics which includes not only the transportation of humans but also how much ease each mode provides for an effective and efficient transportation solutions. This paper studies the concept of passenger logistics with the example of Delhi Metro and its benefits and future aspect of the concept.

Citation: Siddharth Bhatt and Farhat Fatima, 2017. "Managing passenger logistics: the Delhi metro way", *International Journal of Current Research*, 9, (05), 49788-49791.

INTRODUCTION

Passenger logistics is the transportation of people (passengers) from one place to another using a means of transportation in an efficient and effective manner. It includes such services which helps the passengers to reach their destination in a timely and cost effective manner. No two people and thus no two passengers are alike. However, passengers do have something in common. They have a common purpose of arriving at their destination on time and in a safe manner. They want to travel in comfort. But there are several factors which can hinder over journey:

- They may be confused by the operator's time table or not being able to obtain the correct information.
- They may be confused by the fare structure.
- They may be afraid not to reach their destination on time with a particular mode of transportation.
- They may have with them elders, disabled and children who have some difficulty in travelling.
- They may have difficulty in spotting the signage or hearing the announcement.

Corresponding author: **Siddharth Bhatt,**
Research Analyst, eTouch Systems India Pvt. Ltd.

LITERATURE REVIEW

Few research has been done on this topic. DjurdjicaCakić and Rainer Witzig (2009) conducted a similar study in Serbian cities regarding urban logistics. The recent research shows that in 2009 the dominant mode is walking (48%), while app. one quarter of all trips is realized by cars. The rate of public transport is 22%, while the trips by bikes and motorcycles are almost neglected (2.5%). The city has partly developed bicycle lines and there are no separate traffic lanes for public transport. The goal of traffic planners is to continue to favour the slower and public modes of passenger transport by using different measures in the future. According to Professor LoverajTakru and Professor Mandan (2014), passenger handling process does have an effect on the value chain of the transport provider since it helps the service provider to provide efficient service to its passengers. According to Rahul Goel and Geetam Tiwari (2014), India's transport sector accounts for 13% of the country's energy related CO_2 emissions (MoEF, 2010). It is evident that opportunities exist to make India's transport growth more sustainable by aligning development and climate change agendas. India's National Action Plan for Climate Change (NAPCC) recognizes that GHG emissions from transport can be reduced by adopting a sustainability approach through a combination of measures such as increased use of public transport, higher penetration of bio-fuels, and enhanced energy efficiency of transport vehicles.

According to Sachin Sabharwal and Mona Goel (2011), The growing demand for public transport in mega cities has serious effects on urban ecosystems, especially due to the increased atmospheric pollution and changes in land use patterns. An ecologically sustainable urban transport system could be obtained by an appropriate mix of alternative modes of transport resulting in the use of environmentally friendly fuels and land use patterns. The introduction of CNG in certain vehicles and switching of some portion of the transport demand to the metro rail have resulted in a significant reduction of atmospheric pollution in Delhi. According to MuktiAdvani and Geetam Tiwari (2005), Transport situation in most Indian metropolitan cities is rapidly deteriorating because of the increasing travel demand and inadequate transportation system. Indian cities of all sizes are facing the crisis of urban transport. Despite investments in road infrastructure and plans for land use and transport development, all face the problem of congestion traffic accidents and air pollution and the problems continue to grow. Large cities are facing an unprecedented growth of personal vehicles (two wheelers and cars) and in medium and small cities different forms of intermediate public transport provided by informal sector are struggling to meet the mobility demands of city resident. Investments in high capacity rail based mass transit systems are being promoted to arrest this trend.

According to Anjlee Agarwal, Nidhi Madan and Nipun Malhotra, every individual, including Person with Disabilities (PwDs), has the right to travel and to use public transportation with dignity and independence. It is a fundamental right of all citizens regardless of their abilities and disabilities, since travel is usually a daily necessity for education, employment, medical attention, and entertainment. Obstacles in existing transportation systems i.e. vehicles, terminals, and operations induce fatigue, restrict educational and employment opportunities thus causing frustration. It hinders the right to freedom of movement, equal participation and access to health and other social services.

DELHI METRO

The Delhi Metro is a metro system serving Delhi and its satellite cities of Faridabad, Gurgaon, Noida and Ghaziabad in National Capital Region in India. Delhi Metro is the world's 12th largest metro system in terms of both length and number of stations. Delhi Metro Rail Corporation Limited (DMRC), a state-owned company with equal equity participation from Government of India and Government of Delhi, built and operates the Delhi Metro. A member of the Nova Group of Metros, the network consists of five color-coded regular lines and the faster Airport Express line, with a total length of 213 kilometers (132 mi) serving 160 stations (including 6 on Airport Express line). The system has a mix of underground, at-grade, and elevated stations using both broad-gauge and standard-gauge. The metro has an average daily ridership of 2.4 million passengers, and, as of August 2010, had already carried over 1.25 billion passengers since its inception.

BACKGROUNG

The concept of a mass rapid transit for New Delhi first emerged from a traffic and travel characteristics study which was carried out in the city in 1969.

Over the next several years, many official committees by a variety of government departments were commissioned to examine issues related to technology, route alignment, and governmental jurisdiction. In 1984, the Delhi Development Authority and the Urban Arts Commission came up with a proposal for developing a multi-modal transport system, which would consist of constructing three underground mass rapid transit corridors as well augmenting the city's existing suburban railway and road transport networks.

While extensive technical studies and the raising of finance for the project were in progress, the city expanded significantly resulting in a twofold rise in population and a fivefold rise in the number of vehicles between 1981 and 1998. Consequently, traffic congestion and pollution soared, as an increasing number of commuters took to private vehicles with the existing bus system unable to bear the load. An attempt at privatizing the bus transport system in 1992 merely compounded the problem, with inexperienced operators plying poorly maintained, noisy and polluting buses on lengthy routes, resulting in long waiting times, unreliable service, extreme overcrowding, unqualified drivers, speeding and reckless driving. To rectify the situation, the Government of India and the Government of Delhi jointly set up a company called the Delhi Metro Rail Corporation (DMRC) on 3 May 1995, with E. Sreedharan as the managing director.

CONSTRUCTION

Physical construction work on the Delhi Metro started on 1 October 1998. After the previous problems experienced by the Kolkata Metro, which was badly delayed and 12 times over budget due to "political meddling, technical problems and bureaucratic delays", DMRC is a special purpose organization vested with great autonomy and powers to execute this gigantic project involving many technical complexities, under a difficult urban environment and within a very limited time frame. DMRC was given full powers to hire people, decide on tenders and control funds. The DMRC then consulted the Hong Kong MTRC on rapid transit operation and construction techniques. As a result, construction proceeded smoothly, except for one major disagreement in 2000, where the Ministry of Railways forced the system to use broad gauge despite the DMRC's preference for standard gauge. The first elevated line of the Delhi Metro was inaugurated by Sh. Atal Bihari Vajpayee, the Prime Minister of India, on 24 December 2002 & the first underground line was inaugurated by Dr Manmohan Singh on 20 December 2004, and thus, it became the second underground rapid transit system in India, after the Kolkata Metro. The first underground section of Delhi Metro was VishwaVidyalaya - Kashmere Gate section which included 4.5 km tunnel & 4 stations namely VishwaVidyalaya, Vidhan Sabha, Civil Lines &Kashmere Gate station. This project was constructed by Kumagai-Skanska-HCC-Itochu JV or KSHI-JV, a joint venture between Kumagai Gumi, Skanska, Hindustan Construction Company & Itochu. The first phase of the project was completed in 2006, on budget and almost three years ahead of schedule, an achievement described by Business Week as "nothing short of a miracle".

NETWORK

The Delhi Metro is being built in phases. Phase I completed 58 stations and 65.0 km (40.4 mi) of route length, of which 13.0 km (8.1 mi) is underground and 52.1 km (32.4 mi) surface

or elevated. The inauguration of the Dwarka–Barakhamba Road corridor of the Blue Line marked the completion of Phase I on October 2006. Phase II of the network comprises 124.6 km (77.4 mi) of route length and 85 stations, and is fully completed, with the first section opened in June 2008 and the last line opened in August 2011. Phase III (103 km, 69 stations) and Phase IV (113.2 km) are planned to be completed by 2016 and 2021 respectively, with the network spanning 413 km (257 mi) by then.

Line	Stations	Length (km)	Terminals
Red Line	21	25.09	Dilshad Garden-Rithala
Yellow Line	37	49	SamaypurBadli-HUDA City Centre
Blue Line	44	49.93	Noida City Centre-Dwarka Sector 21
	7	8.74	Yamuna Bank-Vaishali
Green Line	14	15.14	Inderlok-Mundka
	2	3.32	Ashok Park Main-Kirti Nagar
Violet Line	28	35.17	ITO-Escorts Mujesar
Airport Express (Orange Line)	6	22.70	New Delhi-Dwarka Sector-21
Total	160	213	

Source: DMRC

MANAGING PASSENGER LOGISTICS

Managing passenger logistics has never been easy for Delhi Metro because of large chunk of population residing in Delhi as well as in National Capital Region (NCR). The population of Delhi alone is 11,034,555 and counting whereas in NCR (including Delhi) is around 46,069,000 and counting. People daily travel across NCR for work and other purposes and choose that mode of transport which helps them in reaching their destinations on time. Delhi Metro was started with the aim to provide seamless transportation service with high level of quality to their passengers across Delhi-NCR. And it has managed to do that in an effective and efficient way. Some of the points justifying the statement are as follows:

Operations: Trains operate at a frequency of one to two minutes to five to ten minutes between 05:00 and 00:00, depending upon the peak and off-peak hours. Trains operating within the network typically travel at speed up to 50 km/h (31 mph), and stop for about 20 seconds at each station. Automated station announcements are recorded in Hindi and English. Many stations have services such as ATMs, food outlets, cafés, convenience stores and mobile recharge. Eating, drinking, smoking and chewing of gum are prohibited in the entire system. The Metro also has a sophisticated fire alarm system for advance warning in emergencies, and fire retardant material is used in trains as well as on the premises of stations. Navigation information is available on Google Transit. Since October 2010, the first coach of every train is reserved for women. However, last coaches are also reserved when the train changes track at the terminal stations in the Red, Green and Violet Lines. To make travelling by metro a smoother experience, Delhi Metro has launched its own official app for smartphone users, (iPhone and Android) that will provide information on various facilities like nearest metro station, fare, parking availability, tourist spots near metro stations, security and emergency helpline numbers.

Security: Security on the Delhi Metro is handled by the Central Industrial Security Force (CISF), who have been guarding the system ever since they took over from the Delhi Police in 2007. Closed-circuit cameras are used to monitor trains and stations, and feed from these is monitored by both the CISF and Delhi Metro authorities at their respective control rooms. Over 3500 CISF personnel have been deployed to deal with law and order issues in the system, in addition to metal detectors, X-ray baggage inspection systems, and dog squads which are used to secure the system. About 5,200 CCTV cameras have been installed, which cover every nook and corner of each Metro station.

Each of the underground stations has about 45 to 50 cameras installed while the elevated stations have about 16 to 20 cameras each. The monitoring of these cameras is done by the CISF, which is in charge of security of the Metro, as well as the Delhi Metro Rail Corporation. Intercoms are provided in each train car for emergency communication between the passengers and the train operator. Periodic security drills are carried out at stations and on trains to ensure preparedness of security agencies in emergency situations. DMRC is also looking at raising the station walls and railings for the safety of passengers.

Ticketing and Recharge: For the convenience of customers, Delhi Metro commuters have three choices for ticket purchase. The RFID tokens are valid only for a single journey on the day of purchase and the value depends on the distance travelled, with fares for a single journey ranging from □8(12¢ US) to □30 (45¢ US). Fares are calculated based on the origin and destination stations using a fare chart. Travel cards are available for longer durations and are most convenient for frequent commuters. They are valid for one year from the date of purchase or the date of last recharge, and are available in denominations of □200 (US$3.00) to □1,000 (US$14.90). A 10% discount is given on all travel made on it. A deposit of □50 (74¢ US) needs to be made to buy a new card which is refundable on the return of the card any time before its expiry if the card is not physically damaged. Tourist cards can be used for unlimited travel on the Delhi Metro network over short periods of time. There are two kinds of tourist cards valid for one and three days respectively. The cost of a one-day card is □150 (US$2.20) and that of a three-day card is □300 (US$4.50), besides a refundable deposit of □50 (74¢ US) that must be paid at the time of purchasing the card. According to new regime, the maximum permissible time limit for stay within the Metro system – 170 minutes at present – will now be 180 minutes for those buying tickets of Rs. 23 or above, 100 minutes for tickets costing Rs. 19–23, and 65 minutes for tickets up to Rs. 18.

Ridership: Delhi Metro has been registering a continuous increase in ridership since its inception. When Metro services were introduced in 2002, the average ridership was 80,000 passengers per day. As of 2015, daily ridership has risen to 2.6 million, with the latest ridership record set on 28 August 2015. On 4 August 2014 daily ridership crossed the 2.7 million figure. Since then the highest ridership has kept on surpassing the previous best, compelling metro authorities to keep increasing the services on busy routes. Most recent Delhi Metro daily ridership record of 3.175 million passengers was reached on the eve of the Rakshabandhan (28 August 2015), when commuters poured in large numbers throughout the day. On 25 December 2014, it was reported that the ridership of the Airport Express had almost doubled in the past year to almost 600,000 passengers per month now, as compared to just above 300,000 at the beginning of the calendar year.

Currently, Delhi Metro has about 220 trains of four, six and eight coaches totaling 1,290 coaches. It is further planning to

add 421 more coaches on the existing route before the completion of phase 3. During the financial year 2015, DMRC on an average pressed 1,083 coaches in an hour (during peak hour), in 2012–13, the number was 819. On an average trains make 2,880 trips per day.

Infrastructure: The infrastructure of Delhi Metro is nothing but of a miracle. The Metro uses rolling stock of two different gauges. Phase I lines use 1,676 mm (5.499 ft.) broad gauge rolling stock, while three Phase II lines use 1,435 mm (4.708 ft.) standard gauge rolling stock. Trains are maintained at seven depots at Khyber Pass and Sultanpur for the Yellow Line, Mundka for the Green Line, Najafgarh and Yamuna Bank for the Blue Line, Shastri Park for the Red Line, and Sarita Vihar for the Violet Line. The organization uses cab signaling along with a centralized automatic train control system consisting of automatic train operation, Automatic Train Protection and automatic train signaling modules.

A 380 MHz digital trunked TETRA radio communication system from Motorola is used on all lines to carry both voice and data information. For Blue Line Siemens Transportation Systems has supplied the electronic interlocking Sicas, the operation control system Vicos OC 500 and the automation control system LZB 700 M. An integrated system comprising optical fibre cable, on-train radio, CCTV, and a centralized clock and public address system is used for telecommunication during train operations as well as emergencies. For Red and Yellow lines ALSTOM has supplied signaling system and for line Green and Violet Bombardier Transportation has supplied CITYFLO 350 signaling system.

Safeguarding Environment: Besides managing passengers, the organization also safeguards its environment for a better standard of living. It has been given ISO 14000 for environmental friendly construction. Most of the Metro stations on the Blue Line conduct rainwater harvesting as an environmental protection measure. It is also the first railway project in the world to earn carbon credits after being registered with the United Nations under the Clean Development Mechanism, and has so far earned 400,000 carbon credits by saving energy through the use of regenerative braking systems on its trains. Also they have installed Solar Panels in some of their stations for reducing their dependence on non-renewable sources of energy.

Conclusion

Passenger logistics has been an integral part of any city for better management and movement of people through the use of better and reliable mode of transport. In this case, Delhi Metro is one of the finest examples for managing passenger logistics in and effective and efficient way. They have not only transformed Delhi into a beautiful city but has helped in making public transport a better alternative for mass transportation. It has managed to defy all odds and has set an example for other Indian cities as well as other developing countries for an effective and efficient mode of transportation. During the Odd-Even rule, this system played a great role in managing huge passenger flow which otherwise use their own private vehicles for travelling. This system is still undergoing projects for Phase-3 and Phase-4 for expansion in Delhi and NCR and will surely manage passenger logistics in a better way in future.

REFERENCES

CakićDjurdjica and Witzig Rainer, 2009. City Logistics and Urban Passenger Transportation – Comrades or Competitors?

Prof. TakruLoveraj and Prof. Madaan, 2014. Passenger Handling Process and Value Chain Improvement.

Goel Rahul and Tiwari Geetam, 2014. Promoting Low Carbon Transport in India., UNEP Risø Centre on Energy, Climate and Sustainable Development.

Sabharwal Sachin and Goel Mona, 2011. Delhi Metro: A solution to problem of congestion and pollution in the modern city like Delhi., International Journal of Business Economics and Management Research., Volume 2, Issue 9.

AdvaniMukti and Tiwari Geetam., Evaluation of Public Transport: Case study of Delhi Metro., Transportation Research & Injury Prevention Programme., Indian Institute of Technology, Delhi, India.

Agarwal Anjlee, Madan Nidhi, Malhotra Nipun., Delhi Metro: Mobility for all., SAMARTHYAM, National Centre for Accessible Environments, New Delhi, India

Websites

Delhi Metro-www.delhimetrorail.com
Wikipedia-www.wikipedia.com

****