LAST MILE CONNECTIVITY (LMC) FOR ENHANCING ACCESSIBILITY OF RAPID TRANSIT SYSTEMS

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SUMMARY

Increasing vehicle ownerships, alarming rise in private automobile dependency, traffic congestion and rise in pollution levels have compelled more and more metropolitan cities in India to opt for rapid transit systems such as metro rail and BRT systems. Delhi, as the capital city has seen huge investments to augment its transport network as well as an expanding rapid transit system – both metro rail and bus rapid transit (BRT). Despite this, the problem of congestion on Delhi streets persists. It highlights the fact that mere provision of rapid transits is not sufficient to dissuade commuters from using private modes. Commuters are more likely to shift to public transport if factors such as accessibility, comfort, convenience, journey time and/or cost are not severely compromised upon.

The aspect of providing economical and convenient “last mile connectivity” (LMC), that is, from the trip ends to the point of accessing a public transport system, is an area of much neglect in Indian cities, including in Delhi. While feeder services do exist, their services are limited to a few and selective stations. The rest of the demand is principally met through intermediate public transport (IPT) such as autorickshaws (that sometimes cost more than fifty percent of the total cost of the journey) or through cycle rickshaws, which are again restricted to certain areas. There remains a lack of conscientious efforts towards integrating these IPTs with rapid transit systems and optimizing their potential as an LMC option. The lack of adequate walkable and cyclable environment in the city further accentuates the problem of public transport users.

This paper presents findings of a study based on a small sample survey in the context of Delhi metro. The survey was conducted during morning and evening peak hours and included metro commuters on different routes, some on-board and some at metro stations. The survey also included private mode commuters whose offices are located within a kilometer of a metro station. The survey primarily targeted regular commuters and as such only work/education related trips were included.

The important questions that this paper seeks to address are: an assessment of comfort, time, distance, cost, incurred in LMC as proportion of the total journey for rapid transit users; user preferences and options available, for LMC; and finally, whether lack of efficient LMC options is a decisive factor in commuters choice of private modes.

KEYWORDS: last mile connectivity, rapid transit systems, accessibility, intermediate public transport, feeder services

PURPOSE OF THE STUDY

Burgeoning population pressure, changes in life-style and socio-economic conditions in modern metropolitans have been accompanied by increasing vehicle ownerships, growing share of personalized modes of travel on urban streets, traffic congestion and rise in pollution levels. The Working Group on Urban Transport for the 12th Five Year Plan (FYP) describes the present scene of urban transport across India as categorized by sprawling cities; declining share of public transport and non-motorised transport; focus on supply side yet with low investments; sheer neglect of pedestrians, cyclists and public transport users; and increased motorization leading to pollution and high road fatalities/injuries. Despite investments being made to develop and expand the road (and rail) networks, there has been but little respite from the problems of congestion. The annual growth rate of motorized vehicles during last decade has been around 10%. During year 2000 more than 6.2 million vehicles were plying in mega cities, which accounted for 12.7 % share of country's vehicle population. Two wheelers in most of the cities account for 60-80% of the total number of motor vehicles. (RITES,1995)

This high dependence on private modes often leads to dwindling role of public transport modes. The bus supply in cities vary from a low of 0.12 buses/1000 population in size I cities to 0.46 in size VI cities reflecting inequities in public supply provisions. (RITES,1995) Developing an effective and efficient public transport thus becomes an important pre-requisite for sustainable transport systems and subsequently for sustainable cities. This growing concern for the need of efficient public transport system has witnessed, over the last decade, more and more metropolitan cities opting for rapid transit systems such as metro rail and BRT.

While one of the objectives of these systems is to offer the public transport user a quality alternative, another (and perhaps more important) objective is to persuade commuters to shift from personalized modes (cars, two-wheelers) of travel to public transport. It is the second objective that poses a challenge to transport planners, as modal choice is influenced by not merely the quality of public transport system but a variety of other factors. It has to be understood that public transport systems are limited by their lower accessibility (in terms of direct access from trip ends); on the other hand, private modes offer a variety of advantages such as demand mobility, comfort, status, speed, and convenience. While factors such as "status" is beyond the direct control of planners and policy makers, it may be possible to exercise influence on enhancing accessibility, mobility, and even convenience and comfort to a considerable extent, of rapid transit systems. The prime advantage that private modes offer over public transport is direct access from and to trip ends and this is where perhaps the focus is drawn to "last mile connectivity". The purpose of this paper is to examine the role of last mile connectivity in enhancing accessibility to rapid transit systems.

METHOD OF STUDY

Delhi has been selected as the case study area. The city has currently two types of transit systems – metro rail transit system (henceforth, referred to as metro) and bus rapid transit (BRT) system. This paper discusses findings related to metro. Primary survey was conducted, divided over two commuter categories: current metro commuters, and private vehicle commuters whose destinations are close to a metro station. Interviews for the first commuter group were conducted on board or at metro stations along different metro routes of Delhi; a total of 142 samples were collected. The second group was interviewed near entrance gates/ parking lots of offices/institutes around Pragati Maidan metro station (20 samples) and Mandi House metro station (15 samples). The offices selected were within a kilometre from metro stations). The surveys were conducted on working days during morning peak hours. The focus of the study being regular trips, only work and education trips were included.

INTRODUCTION

1 Last Mile Connectivity - Concept

As the name signifies, last mile connectivity implies connecting services to the end point. The phrase has originally been used in the telecommunications and technology industries to describe the technologies and processes used to connect the end customer to a communications network. It is the final leg of delivering connectivity from a communications provider to a customer. Although the term reads `mile', the actual distance of this leg may be considerably more than a mile, especially in rural areas.

In the context of urban transport, the term finds relevance in public transit systems where it is referred to as both the initial and final leg of delivering connectivity - from origin to transit system and from transit system to destination. Last mile connecting services enable commuters to easily connect or transfer to mainline: rail / bus lines either at the commencement or the end of their trips. They are important because they complement rapid transit services by offering commuters the complete trip they need. The person's reverse trip is also an important aspect of last mile connectivity. A reverse trip can vary from the initial trip because of time of day, traffic, time of year and several other factors.

Often last mile connectivity is read synonymous with feeder services. However, It implies much more than just a feeder service; it incorporates:

- easy availability of mode and options
- the time and cost incurred in the last mile
- ease of changing between modes
- ease of walking/cycling to/from stops/ stations.

2 Last Mile Connectivity in Delhi

Delhi, as the capital city has seen huge investments to boost and augment its transport network and expand its rapid transit system. However, the aspect of providing cheaper and convenient “last mile connectivity” to public transport users is an area of much neglect in the city. While feeder bus services do exist in certain areas in the city, their services are limited to a few and selective stations.

A certain part of the demand is met through para-transit modes such as auto-rickshaws. Auto rickshaws supply in particular in Indian cities indicate that major metro cities exhibit a higher share of auto rickshaws ranging between 7 – 13 auto rickshaws per 1000 population compared to smaller cities supply ranging between 0.3 to 2 auto rickshaws per 1000 population (Wilbur Smith, 2007). While auto-rickshaws are convenient, quite often, they are expensive in the city, sometimes costing more than fifty percent of the total cost of the journey; carry individual passengers thereby adding to the burden on the road space; and operate in an unorganised manner. Cycle rickshaws serve as important feeder systems, but are available only in certain areas.

For a larger mass cycling and walking are the only solutions for negotiating the final stretch that public transport doesn’t reach. A report drafted in 2008 by Mirabilis Advisory says, “In bigger cities, the proportion of people using conventional public transport was high, and consequently commuters walked the last mile”. “For instance, in cities with more than 8 million population: 22 percent walked all the way, 8 percent used cycles and 44 percent used public transport. This adds up to 74 percent of people who rely on non-motorized transport for at least part of the commute,” the report says.

Although walking becomes an inevitable last mile connectivity option, it comes with a disclaimer: the local climate, physical condition and distance. The apathetic attitude towards provision of pedestrian facilities in Indian cities does not encourage users to readily go for this option, unless when compelled to do so. A World Bank report on “Demand, Constraints and Measurement of the Urban Pedestrian Environment” in 2008 remarks, “The urban poor make up a city’s ‘captive walkers,’ but since this group has the least resources, it usually has the smallest political voice”.

The lack of suitable last mile options discourages commuters to shift to public transport, despite being offered a state of the art rapid transit system. At the same time, it compels transit commuters to use private modes such as cars and bikes for last mile connectivity, thereby creating a massive parking demand at metro stations. Last but not the least, it makes the overall journey expensive, tiring, unsafe and unpleasant for the transit users. In order to make public transit systems more accessible to the commuter, planning for transit systems and LMC needs to be dealt with in a wholistic and integrated manner.

STUDY FINDINGS

The study incorporates, for the metro-commuters, an analysis of time, distance, cost, and convenience aspects of the overall journey, which was sub-divided into three

main components: ‘Origin to Metro’ (O-M), in-metro (M) and ‘Metro to Destination’ (M-D). The analysis also includes the types of modes opted for LMC, perceived problems and user characteristics. The questions included in the survey performa on problems faced were deliberately left open-ended in order to get the actual perception of the commuters. It is significant to note the findings in the light of the study scope which covers only work and education related trips captured during morning peak hours. This implies that most of the trips might be originating from the ‘home’ end and terminating at the ‘work’ end.

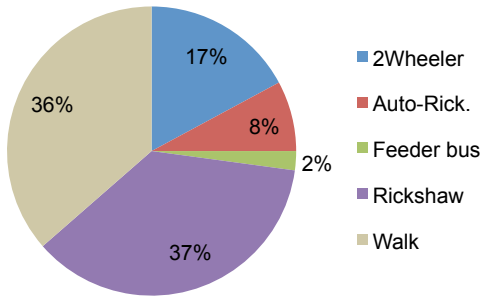
1 Metro Commuters

1.1 Modes used for covering ‘Last Mile’

The type of mode opted for negotiating the last mile, varies at the initial (hereafter referred to as O-M) and the final (hereafter referred to as M-D) legs of the overall journey, with the exception of those commuters who opt for walking in the O-M section. Approximately 60% of the commuters, who choose to walk while reaching the boarding metro station, also opt for the same while reaching the destination from the alighting metro station.

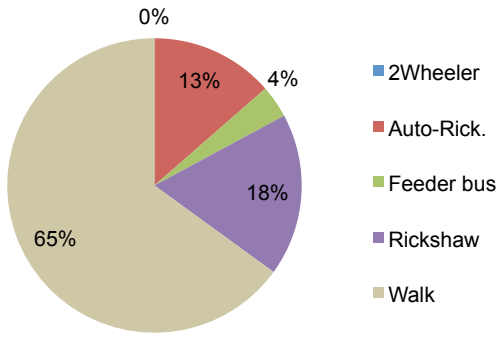
Figure 1.1and 1.2 illustrate the distribution of modes at the O-M and M-D sections respectively. It can be seen that cycle-rickshaw and walking are the most favored mode in ‘O-M’ (with an almost equal share between the two); together they comprise almost three-fourth of all the modes put together. In case of ‘M-D’ walking is the predominant mode; this may be contributed to several factors, such as shorter distance between alighting metro station and final destination, non-availability of cycle-rickshaws and/or other feeder services at metro stations near work ends.

Fig.1.1 'LAST MILE' MODE OPTED
(Origin to Metro Station: O-M)



Source: Primary Survey, 2010

Fig.1.2 'LAST MILE' MODE OPTED
(Metro to Destination: M-D)



Source: Primary Survey, 2010

A closer examination of the collected sample reveals that more than half of those who took a two-wheeler (motorcycles, scooters and mopeds) in the O-M stretch, opted to walk at the M-D end. Three-fourth of the commuters who took a cycle-rickshaw in reaching the metro, walked to their destination from the metro. It is also interesting to note that not a single commuter took an auto-rickshaw at both ends of the journey. This points to two things: that commuters are not willing to travel a larger distance to/ from the transit stops at both ends of the commute and that they want to keep the cost of the overall journey down as auto-rickshaw is one of the most

expensive feeder service available to the user in the present scenario. None of the person interviewed used bicycles and cars as LMC options in both the sections. This may also be due to the limited size of the sample.

1.2 Time and Cost of 'Last Mile'

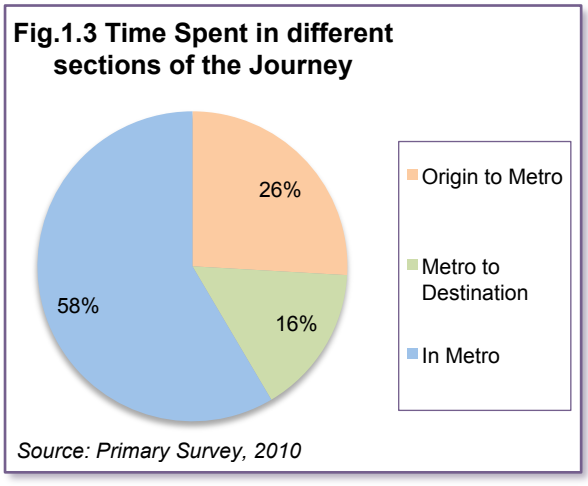
The average time spent and cost incurred in covering the last mile reflect a lot about the quality and availability of last mile services. Table1.1 shows that the average times spent from origin to metro, in-metro, and metro to destination were 12.8, 28.9, 7.7 minutes respectively. The time spent in LMC as a proportion of total journey time is 42 percent (Refer Fig.1.3). This is despite the duration of time spent 'in metro' includes the time spent in reaching the platform, and waiting for the metro. Despite walking being the predominant mode in M-D, the corresponding average time is lower than in O-M, which may indicate that users prefer to spend less time in the last leg of the journey.

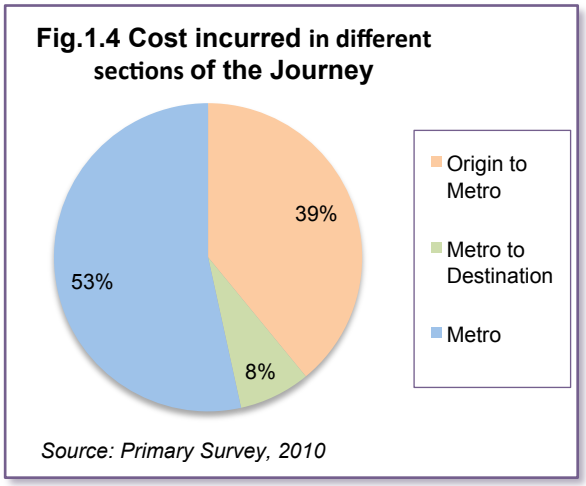
Table 1.1 Average Time and Cost of 'Last Mile'

Journey Sections	Average Journey Time (in minutes)	Average Journey Cost (in Rupees)
Origin to Metro	12.8 (26%)	12.5 (39%)
Metro to Destination	7.7 (16%)	2.4 (8%))
In Metro	28.9 (58%)	17.1 (53%)
Total Journey	49.4 (100%)	32.0 (100%)

Source: Primary Survey, 2010

Table1.1 also indicates that the average transport cost incurred from origin to metro, in-metro, and metro to destination were Rs.12.50, Rs.17.10, Rs.2.40 respectively. The cost of LMC as a proportion of total journey cost is 47 percent, despite the fact that 36% and 65% of the commuters walk the last mile at the initial and the final legs of the journey respectively.





The major chunk of the LMC cost is spent in reaching the metro station from the point of origin (Refer Fig.1.4). The lower proportion of cost in the final leg of the journey can be explained by the fact that more than half (65%) walk the last mile. If the walk trips were removed, the average cost of the last mile would come out

significantly higher than the cost of the 'in-metro' journey.

1.3 Perceived Problems

The problems cited out by metro users ranged from over-crowding during peak hours, low frequency of metro services, too long walking distance, high costs of LMC and unavailability of proper feeder services at either of the journey ends and unsafe walking environment. More than ninety percent of the respondents listed down at least one of the problems that were related to LMC. Amongst the major problems related to LMC cited by commuters were high costs of LMC (45%), inadequate feeder buses (15%), long walking distances in at least one trip-end (38%) and unsafe and tiresome walking environment (36%). More than half of those who cited problems in the last two categories were women and elderly. A small proportion of the commuters also found it difficult to change modes at the metro station.

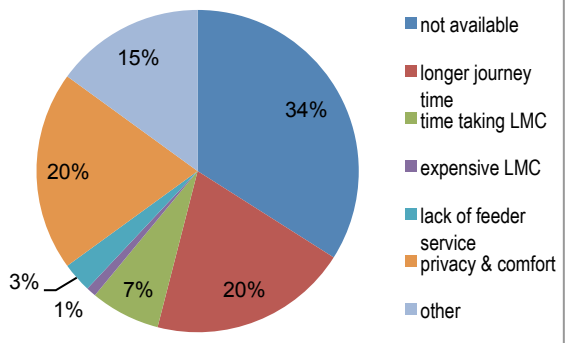
2 Private Mode Commuters

Amongst the second group of respondents constituting of private mode users interviewed in offices and institutions within a mile of metro stations, 74% were car users and the rest two-wheeler users. All respondents were in the middle or higher income brackets: monthly income ranging between Rs.25,000-40,000 (46%), Rs.41,000-50,000 (47%) and more than Rs.50,000 (7%).

Figure 2.1 illustrates the various reasons pointed out by private mode commuters for not using metro. 11% of the respondents cited reasons that were directly related to LMC (time-taking, expensive or lack of feeder service). More than half of those who indicated 'other' problems (comprising 15%) included reasons that also allude to relationship with LMC (viz. unsafe walking, tiresome walking). Approximately 20% said longer overall journey time was the reason for not using metro, which also has some bearing to LMC.

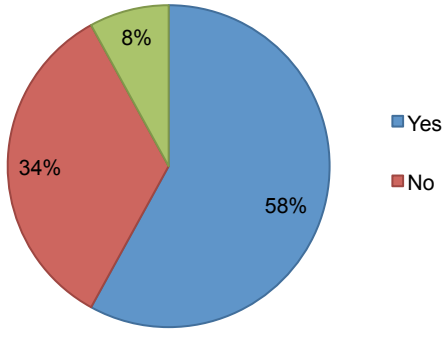
A massive 58% responded that they were willing to use metro if provided with better feeder services; this despite the fact 34% respondents did not have metro facility within a mile at the origin end.

Fig.2.1 Reasons for not using Metro



Source: Primary Survey, 2010

Fig.2.2 Willingness to Use Metro (if provided feeder services)



Source: Primary Survey, 2010

CONCLUSION

The study clearly indicates the step-motherly treatment given to last mile connectivity. Commuters, however view it as an important component of rapid transit systems. Its significance can be gauged from the fact that:

- 65% of current metro users (in the survey conducted) mentioned problems related to LMC.
- The average time spent and cost incurred in LMC is considerably significant (more than 40%).
- Inconvenient and unsafe walking and cycling conditions are also deterrents.
- More than 40% of private mode users point to reasons directly or indirectly related to LMC, for not using metro.
- More than 50% private mode users are willing to use metro if provided efficient feeder services.

Only a small percentage of transit commuters use private modes for last mile connectivity; the majority rely on para-transit modes or on walking and cycling. Despite this, large chunks of land are devoted to private mode parking at various metro stations. At the same time, properly planned and well-designated spaces allocated for auto-rickshaw/ cycle-rickshaw stands at the metro stations are a rarity. These modes find spaces for themselves: near traffic islands, service lanes, and quite habitually, spill over on to the main carriageway. In the process they not only create traffic bottlenecks but also make it difficult for pedestrians to negotiate their way safely amidst all this chaos. In many areas where cycle-rickshaws are not allowed to stand near the metro station, the road being an arterial, they stand on the minor intersecting roads and pedestrians have to again negotiate speeding traffic to access them.

Some of Delhi's metro stations did have feeder bus services but they have been largely unsuccessful because of various reasons. It is believed that for most last mile services to be implemented, collaboration is needed between transit operators, public agencies, local businesses, funding agencies, and non-profit groups. There is also need to utilize new or innovative ideas, concepts and technology. Last mile services need to be dynamic and evolving. The role of cycle-rickshaws, shared autos, low capacity-short distance feeder bus service as LMC options needs to be recognized and implemented in a coordinated manner. It is important to understand that the feasibility of each of these modes may vary with landuses, densities and overall intensity of activities and hence requires judicious planning.

The proportion of public transport users using bicycle for last mile connectivity, at present, is very low. However, it is true that the bicycle has a role to play when it comes to the promotion of public transport. Its potential as feeder system is very high (I-ce, Utrecht, 2000). Last, but not the least, provision of walking and cycling friendly infrastructure and environment on all major and minor roads leading to transit stops is paramount for enhancing accessibility of rapid transit systems. Giving due weightage to LMC planning may not only attract more users to shift from private modes to public transport, it may also in the long run help retaining its existing riders. Quite clearly, LMC needs to be an integral component of rapid transit systems and urban mobility / transport plan preparation process.

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