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Studying Operational Dynamics of Public Bus System: A Case of Lucknow City, India

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Abstract

In the era of rapid urbanization, the public bus system is struggling to become the main mode of transport in Indian cities. The co-existence of private city bus system and intermediate para-transit modes [shared auto-rickshaws, vikrams (6-8 seater shared 3-wheeler) and e-rickshaws] has created more competition for the public bus system instead of complementing it. This paper discusses the existing institutional arrangement of public bus systems in Lucknow city and identifies challenges of organisations to operate an efficient public bus system. The study is based on primary survey and structured interviews of public bus service operators, representatives of private bus operators, representatives of employee unions, auto-rickshaw & vikram drivers, officials of public transport authority and Regional Transport Office (RTO). The study explores public bus governance system and administrative hierarchy of the city to understand its existing operational process. The role of travel cost and comfort in passenger's choice of travel mode is discussed. The financial performance of the LCTSL shows the continuous losses. The paper contributes to identify the role of institutional framework to operate a successful public bus system. The analysis and findings will lead to the use of these modes in an integrated manner to complement and promote public bus system in a city.

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Keywords: Public bus; auto-rickshaws; institutional framework; financial performance; travel cost.

1. Background

A city's image is measured by the availability of a good public transport system. It eases user's travel and allows hassle-free movement. However, it is not easy to establish an efficient public transport system in a city. All modes of public tranportation are capital intensive. It needs a significant capital cost and operation & maintenance cost for its operation. A balanced capital investment plan against the accrued social benefits is a necessary cosideration for

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analysing a sustainable public transport system. In developed economies, adequate capital and knowledge ensure a safe, reliable, fast, accessible and environment friendly public transportation system. Contrary to the developed economies, shortage of capital and knowledge increase the risks of an efficient and environment friendly public transport system.

A transportation system consists of formal and informal institutions, road networks, transport modes (public, para-transit, private and non-motorized), public transport operators, and the users. The formal institutions like the government, the public transport operators aim to enrich social equity by connecting the city regions and extending the public transport system to every sections of the society. The social equity in public transportation service achieved by policy tools such as financial subsidy, cross subsidy and preferential user benefits. Subsidized fare reduces the financial burden of the users and encourages the use of public transportation. However, it also reduces the profit of the service providers and discourages public and private participation in transport service industries.

The objective of the paper is to study the operational characteristics of public bus system in the case city to understand the role of institutions and travel cost for an efficient public transport system. The paper is structured in 6 sections. The first section provides the background of this study. It discusses the importance of public transport system for a city and the users. It also discusses about the study objective of the paper.

The second section presents the literature review which discusses about the public transport institutions, institutional framework, and aspects of social obligations of public transport services. The section discusses about the subsidies provided to the users to enhance social equity among them. It also discusses about the financial condition of the bus service providers by citing example of the bus operators in the metropolitan cities of India.

The third section discusses about the selected case study and the selection criteria for selecting the case study. Characteristics of the case city like demographic profile and location provides a background information about the city.

The fourth section provides the methodology adopted for the study. It includes the information about the primary surveys and the secondary data used for the study. The users choose between public bus system and the IPT as their preferable mode depending on the travel cost and comfort.

The fifth section reviews the public bus operation in Lucknow city. It discusses about the characteristics of the public transport system like institutional framework for public bus and IPT modes, financial performance of the existing service levels for public transport service in the city.

The sixth section records the study inferences and the conclusions about the study. This section discusses the inferences from the review of the public bus system which includes the fragmented institutional framework resulting in lack of coordination between public transport modes and IPT modes in the city.

Nomenclature

GoI	Government of India
GoUP	Government of Uttar Pradesh
NUTP	National Urban Transport Policy
JnNURM	Jawaharlal Nehru National Urban Renewal Mission
LCTSL	Lucknow City Transport Services Limited
RTO	Regional Transport Office
UTD	Urban Transport Directorate

2. Literature review

Public transport services are provided by the government owned institutions or by the private institutions on behalf of the government. Institutions are the systems of rules, either formal or informal, and those rules define the boundaries of any institution and the institutions are the rulers and organizations are players of the game (Mcfadden, Priest, & Green, 2010; North, 1991; Ostrom, Gardner, & Walker, 1994). The formal institutions are empowered with the decision-making power which makes it an important stakeholder to understand the functioning of public transportation system.

Operational characteristics of public transport system include the performance of the public transport service provider e.g. public transport modal share and public transport availability etc. These operational characteristics help to understand the condition of public transport services in the city. Financial aspect of the public transport services is a matter of concern for the bus operators and the government. The governments have to fulfill the moral and ethical responsibility by adhering to the communication needs of the users and provide an affordable public transport service. In the process, the government provides financial incentives to the public transport operators to keep them interested in operating the services. Otherwise, the financial losses will result into a gross failure of public transport service.

Researchers are studying the institutional dynamics of public transpiration. Some of the previous studies conducted talks about the problems of fragmented institutional framework for public transport services (like administrative issues) (IDFC, 2006; Kumar, 2012; Om Prakash Agarwal, 2011). However, the existing studies lack the in-depth study of the institutional framework. This paper contributes in the in-depth understanding of the institutional framework using the institutional mapping method. The study focuses on the empirical evidences from Lucknow city to highlight the issues faced by the public bus service.

2.1. Use of transport subsidy for social benefits

Public transport caters all classes of the people whether rich or poor and provides social equity. The government extends social equity by providing affordable transit system that connects their places of residence and work. The affordability is achieved by direct subsidy to the transit operator. The government determines the quantum of subsidies on the basis of the ratio between the monthly expenditure on transport and the monthly income of the users. The types of subsidies provided to the users are: flat fare system, concessional fares, transport vouchers and mean tested transfer funded from general taxation and quality self-selection (Serebrisky, Gómez-Lobo, Estupiñán, & Muñoz-Raskin, 2009). Flat fare system is a method to cross-subsidize the public transport system where low cost users fund part of the travel cost of high cost users e.g. Nairobi, Delhi, Bhopal etc. In flat fare system fare for a range of kilometers is fixed like a person has to pay INR 10 for 0-5 kilometer of travel, INR 15 for 5-8 kilometers, INR 20 for 8-1o kilometers of travel. For example, a person who is travelling for 2 kilometers and a person who is traveling 5 kilometers, both are paying a minimum fare of INR 10 for their trip. In concessional fares, subsidy is given to a specific group of users like students, senior citizens and physically handicap people e.g. Chile, UK, Mexico, Sophia other eastern Europe etc. In quality self-selection type of subsidy, low quality service is subsidized and co-exists with the high quality non-subsidized service offering equivalent routes e.g. Bogota. In transport vouchers, companies provide transport vouchers to its employees instead of providing monthly transport expenditure e.g. Brazil. In mean-tested transfer funded from general taxation, government transfers subsidy directly to the bank accounts of the identified users e.g. Chile (Serebrisky et al., 2009). These subsidies provided in terms of fare concessions enables weaker sections of the people to use public transport services and make public transport affordable for all.

2.2. Effect of transport subsidy on the public bus operators

The impact of providing subsidies to the users can impact into a widening gap between the operational revenue and the operational expenditure of the public bus service providers. Public transport service providers are either government-owned public transport authority or the external operators under contract with the public transport authority. Public transport authorities and the external operators under contract with these authorities have the support of the government in the form of viability gap funding in case of financial losses. Subsidies can be given to the operators and is classified as a supply tool to the operator's subsidies. It can be in the form of fuel tax rebate, conditional direct operating subsidies, infrastructure grants, and unconditional operating & capital subsidies (Serebrisky et al., 2009). These kind of subsidies minimize financial losses of the operators.

In case of India, the financial condition of the public bus operators is discussed through the financial performance of the public bus service providers of the metropolitan cities. The financial performance of the public bus operators in the metropolitan cities of India e.g. the Delhi Transport Corporation (DTC), the Brihanmumbai Electricity Supply and Transport (BEST, Mumbai), the Metro Transport Corporation (Chennai) Ltd., the Bangalore Metropolitan

Transport Corporation (BMTC), the Chandigarh Transport Undertaking (CTU), the Calcutta State Transport Corporation (CSTC), the Ahmedabad Municipal Transport Service (AMTS) and the Pune Mahamandal (PM) is shown in Table 1. The table suggests huge revenue loss for all the city bus operators (Ministry of Road Transport and Highways, 2016). The losses of the bus operators are expected to increase in future without a comprehensive recovery plan. According to the 7th schedule of the Constitution of India, transportation is considered as the state list. Therefore, it is a responsibility of the state governments to provide and regulate public bus services within their states(Constitution of India, 1977). At present, the state governments provide viability gap funding to the public bus operators to cover up the eventual financial loss. The political gains related to the public transport infrastructure also influence the survival of these service providers.

Table 1 Financial performance of public bus service operators in metropolitan cities of India (year 2013-14 & 2014-15)

Public Bus Service Providers	Total Revenue (in million INR)		Total costs (in million INR)		Net Profit/Loss (in million INR)	
	2014-15	2013-14	2014-15	2013-14	2014-15	2013-14
Ahmedabad MTS	1301.14	1537.47	3541.32	3563.38	-2240.18	-2025.90
BEST Undertaking	15085.59	14351.03	23550.30	21843.51	-8464.71	-7492.48
Bangalore MTC	22568.44	20139.42	23217.48	21615.31	-649.03	-1475.89
Calcutta STC	724.05	619.76	2319.12	2305.25	-1595.06	-1685.49
Chandigarh TU	1110.70	1043.01	1813.99	1755.19	-703.28	-712.18
Delhi TC	11132.11	12095.78	51046.77	46680.31	-39914.66	-34584.53
Metro TC (Chennai) Ltd.	13765.18	13548.61	15959.93	14967.96	-2194.75	-1419.35
Pune Mahamandal	7073.79	6026.253	8750.658	7020.32	-1676.86	-994.07

(Source: Review of Performance of SRTUs 2014-15, Ministry of Road Transport & Highways, Govt. of India)

The situation is similar in other million-plus cities in India. The public bus system is struggling to be the primary mode of transport in these cities. The co-existence of private city bus system and intermediate para-transit modes [vikrams(6-8 seater shared 3-wheeler), auto-rickshaws, and e-rickshaws] has increased competition for the public bus system instead of complementing it. In order to promote public transport system, the Ministry of Housing and Urban Affairs (MoHUA), Government of India, (previously known as Ministry of Urban Development) launched the National Urban Transport Policy (NUTP) in the year 2006. The objectives were to improve public transport systems and non-motorized transport modes; provide financial assistance from the central government; encourage landuse-transport integration, and to discourage use of private vehicles. NUTP also encouraged a people-centric bottom-up approach in cities, where all the plans are prepared for the common benefit and well-being of the people. It has provided a much needed vision - '*moving people rather than vehicles'* to the administrators and planners (Ministry of Housing & Urban Affairs, 2006).

The million-plus cities in India have started investing more in public transport with urban programs such as JnNURM. The urban programmes are providing financial assistance for transport infrastructure including procurement of new buses. Before the JnNURM's bus procurement scheme, the state transport corporations were operating public bus service in these cities. NUTP and JnNURM programs provided the much required incentives of the sustainable public bus system to the million-plus cities. This paper considers a case of Lucknow city in the Indian state of Uttar Pradesh and discusses the pertinent public bus systems. The primary reason for selecting Lucknow is its' low public transport mode shares (10% only), which includes public bus and shared vikrams. The details about modal share are discussed in section 5.1. The ideal public transport modal share in a city is approximately 70%, whereas Lucknow's existing modal share of public transit is approximately 10%. Lucknow also has a metro rail system, which is operational on a very small stretch of 8 kilometers.

This study focuses only on the public bus service because it is the main mode of public transport in the city. Being the capital city of the state, Lucknow is the center of all political and economic activities. All the major administrative and legislative offices are situated in the city. The dichotomy of being the capital city with fragmented public transportation infrastructure generates an academic interest to investigate the case in depth. The

study will help the city to identify possibilities of improving public bus system and establish public transport as the main mode of transport. The next section discusses about the case city and the attributes of the city like city location, demographic profile, and growth pattern.

3. Lucknow city profile

Lucknow urban agglomeration primarily consists of the Lucknow Municipal Corporation. Lucknow Municipal Corporation has a population of 2.82 million and cantonment board area has a population of 0.06 million(Census of India, 2011). Lucknow has a ring-radial road pattern and is growing in circular form (figure 1 and figure 2).

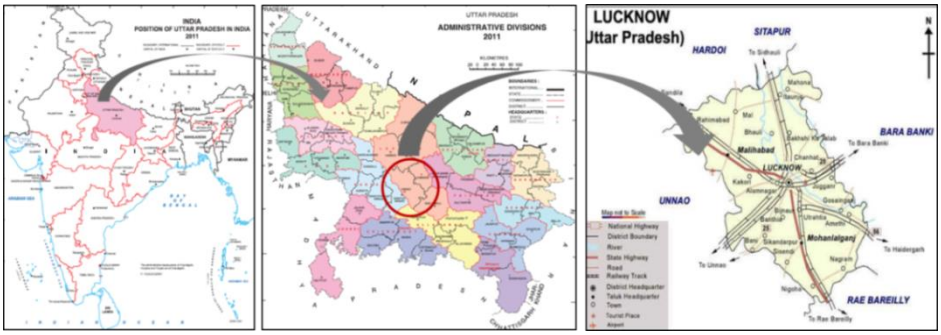

Fig 1: Location of Lucknow city

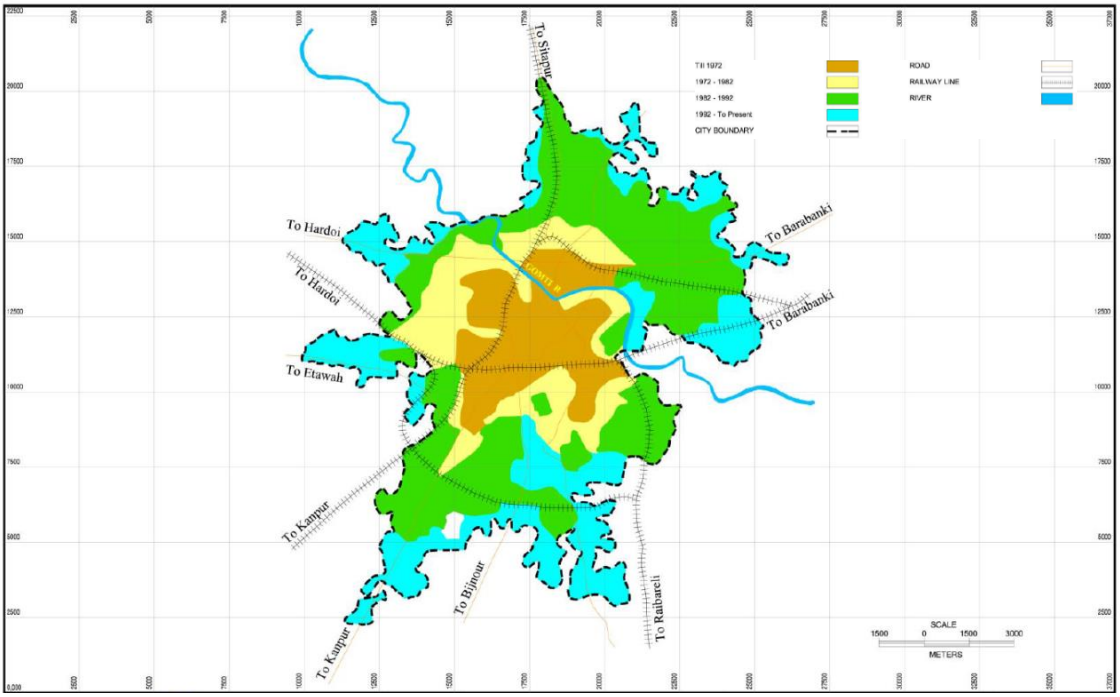

Fig 2: Growth pattern of Lucknow city since 1970 *(Source: City Development Plan, Lucknow, 2015)*

4. Methodology

The objective of the paper is to study the operational characteristics of public bus system in the case city to understand the role of institutions and travel cost for an efficient public transport system. To respond to the objectives of the study three methods have been used. Firstly, the review of public bus operations to understand the operational characteristics of the public bus system. Secondly, the institutional mapping to understand the role of the institutional framework for public bus system. Thirdly, the review of the financial performance of the LCTSL to understand the financial condition of the public bus service provider. The research methodology includes the primary surveys which are processed through the interviews of LCTSL officials, private bus operators, drivers and conductors of the public bus, private bus and auto-rickshaw drivers. Secondary data on vehicle registration data from the Regional Transport Office (RTO), routes of public buses, private bus and auto-rickshaws, the financial performance of public bus operators and previous studies and documents related to city's transport system in Lucknow city were collected from the relevant sources. The study focuses on 3 criteria - understanding of the operational characteristics of the public bus service, existing governance mechanism for public bus system, and the financial performance of LCTSL.

5. Public bus operational characteristics in Lucknow

5.1. Review of the public bus operation in Lucknow city

Public buses are operated by LCTSL, which is a government-owned company and a special purpose vehicle (SPV) formed in the year 2010 under the Companies Act, 1956. It is a joint venture of the GoI and the GoUP, and its other organizations. The major stakeholders of LCTSL are the GoI (50%) and the GoUP (20%). The minor stakeholders are the Uttar Pradesh State Road Transport Corporation (UPSRTC), the Lucknow Development Authority (LDA), the Lucknow Municipal Corporation (LMC), and the Uttar Pradesh Housing Development Board (UPHDB). The minor stakeholders collectively hold 30% stake in the SPV (table 2). LCTSL operates buses within the metropolitan city boundary. Before LCTSL, public buses were operated by the Lucknow Mahanagar Parivahan Sewa (LMPS), which was a subsidiary of UPSRTC, a state-owned organization. LCTSL owns 260 buses, which were procured under the JnNURM scheme in 2010. Till March 2017, only 220 buses were in operation on 52 routes. The route length varies between 15 kilometers to 25 kilometers.

Table 2: Stakeholders of LCTSL, Lucknow

S.No.	Stakeholders	% of Stakeholders
1	Government of India (GoI)	50%
2	Government of Uttar Pradesh (GoUP)	20%
3	• Uttar Pradesh State Road Transport Corporation (UPSRTC), • Lucknow Development Authority (LDA), • Lucknow Municipal Corporation (LMC), • Uttar Pradesh Housing Development Board (UPHDB)	30%

(Source: LCTSL office)

a b

Fig 3: a) Public Bus b) Auto-rickshaws, vikrams and e-rickshaws creating traffic jam at Charbagh railway station, Lucknow (*source: LCTSL website and Hindustan Times website)*

Public buses are operating in Lucknow city since 2005. Before 2005, private buses, vikrams (6-8 seater shared basis taxi) and maxi cabs were the main modes of transport in the city. At present, the use of auto-rickshaws and vikrams along with public buses is predominant in Lucknow. The number of registered vehicles in Lucknow has increased approximately 4 times in the past 20 years (from the year 1998 to 2017) (figure 4). In the year 1998, the total number of registered vehicles was 0.45 million and in the year 2017, it has increased to 1.9 million. For the year 2017, the percentage share of 2-wheelers, 4-wheelers, auto-rickshaws and vikrams are around 80%, 16%, and 0.22% and 0.16% respectively.

Presently, auto-rickshaws and vikrams are also functioning as the public transport modes. The modal share of public transport is only 10%, which includes public buses, private buses, and vikrams. The modal share of 2-wheelers and 4-wheelers is 42% and 5% respectively, which suggests that the people are using private modes of transport more than public transport system (figure 5). The modal share of non-motorized transport including walk, bicycle, and cycle rickshaw is 41%, which is the second highest modal share in the city (GoUP, 2012). It suggests that people prefer to walk, bicycle or use cycle rickshaws because these are the only available modes for last mile connectivity. City buses (public or private), auto-rickshaws and vikrams are in operation on fixed routes. These modes do not provide door to door connectivity. Auto-rickshaws can be hired for the whole trip from origin to destination.

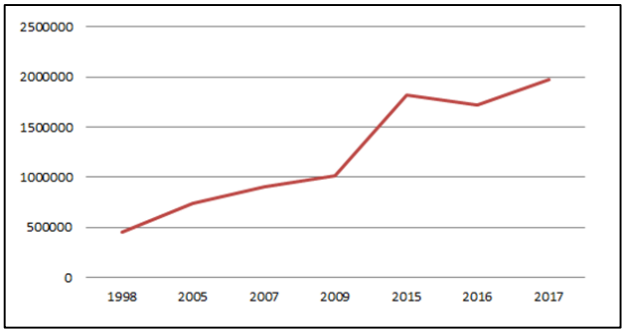

Fig 4: Growth of registered motor vehicles in Lucknow from 1998 to 2017 *(source: RTO, Lucknow)*

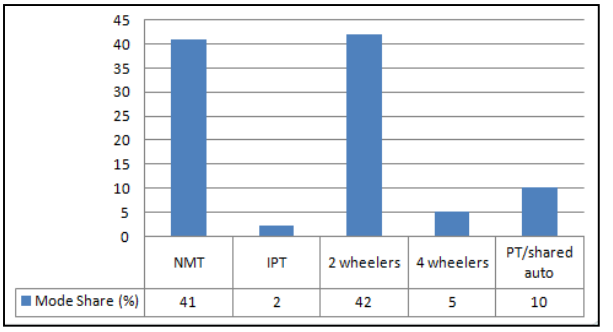

Fig 5: Transport mode share of Lucknow in the year 2009 *(source: Comprehensive Mobility Plan for Lucknow, 2012)*

5.2. Institutional framework for public bus, private bus and IPT modes

Institutional mapping method has been used to understand the existing institutional framework for public transport in the city. This methodology helps to explain the role of institutions and the horizontal, vertical and the diagonal relationship between these institutions related to the public transport system at different hierarchical levels. The decisions related to urban transport are administered by the GoUP. From the central government, MoHUA and MoRTH are responsible for urban transport and road transport respectively. These ministries prepare policies, acts, rules and fund a portion of the total cost to the state governments. The Urban Development Department, GoUP and the Uttar Pradesh Transport Department, GoUP are two entities of the state government which are responsible for urban transport in the city. While the Urban Development Department is responsible for public transport, the Uttar Pradesh Transport Department is responsible for private buses, vikrams, auto-rickshaws, e-rickshaws. At the city level, LCTSL is responsible for operations and maintenance of public buses, RTO Lucknow is responsible for vehicle registration, issuing of permits to motorized vehicles including private buses, vikrams, auto-rickshaws, e-rickshaws and private vehicles (2-wheelers & 4-wheelers). RTO provides route-based permits to public buses, private buses, vikrams and e-rickshaws, and area-based permits to auto-rickshaws. It also approves fare lists of these modes. RTO reports to the Office of Transport Commissioner, GoUP which is under the Uttar Pradesh Transport Department. LCTSL reports to the Urban Transport Directorate, GoUP. Traffic Directorate is responsible for traffic regulation and traffic management which is a unit of the Uttar Pradesh Police. It is a state level organization and has divided the state into six traffic zones. Traffic police report to RTO, Lucknow. Figure 6 shows the hierarchy of these institutions at the central, state and city level. It shows two conflicting organizations for the public bus, and private

bus and IPT modes. Decisions proposed by LCTSL for public buses need the approval of the Office of Transport Commissioner, GoUP. Lack of coordination between these organizations at city level implies that these organizations function independently. Interview of LCTSL officials reveals that constructive efforts to establish public bus as the main mode of transport and reduced use of IPT modes are not considered. It is evident that traffic management decisions are taken by RTO without any consultation with LCTSL.

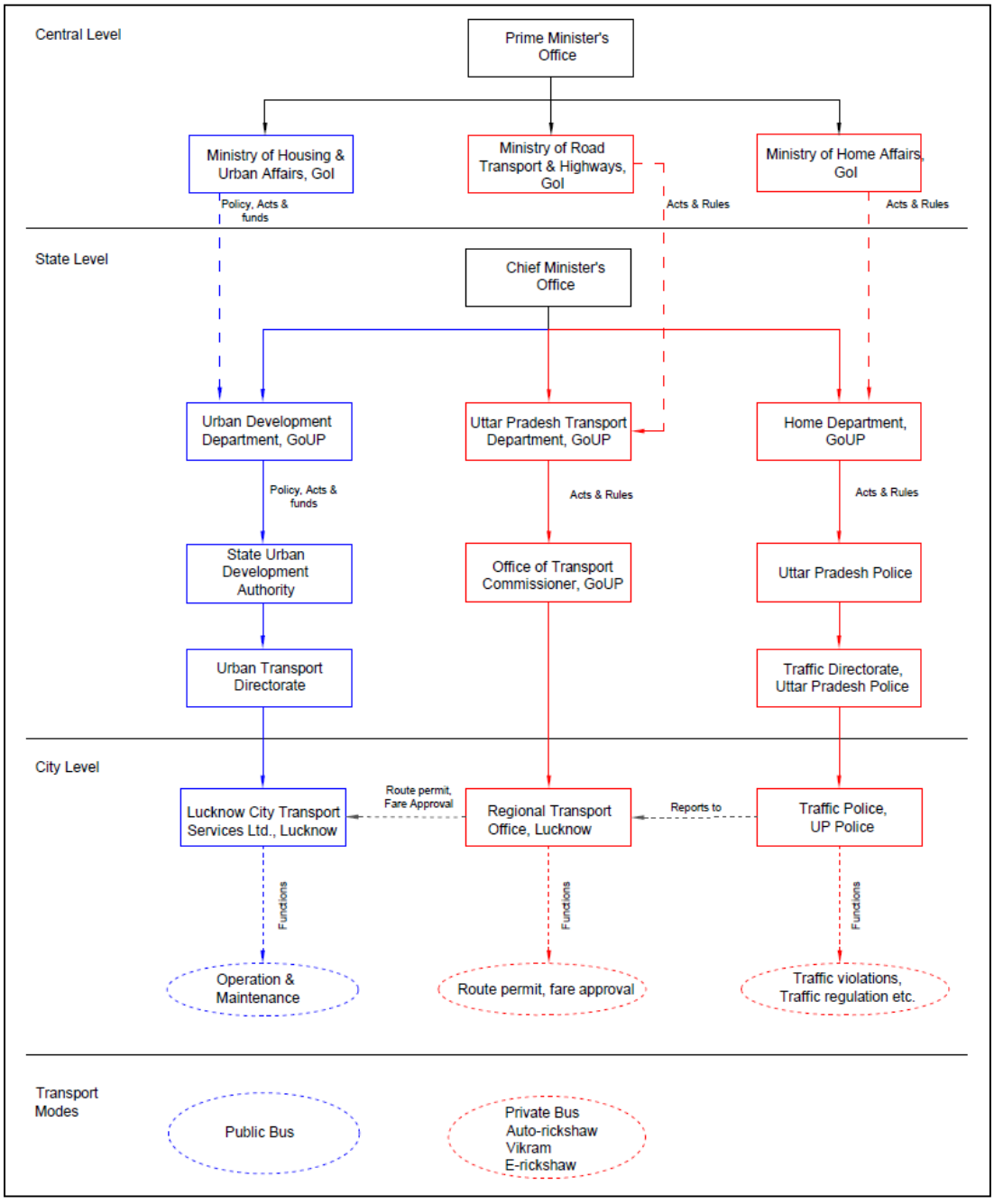

Fig 6: Hierarchy of govarnance levels for operation of public bus, private bus and IPT modes, Lucknow

5.3. Financial performance of LCTSL

The five years' financial performance of LCTSL (from 2012 to 2017), shows continuous operational and total losses for the public bus service operations (table 3). Till the year 2015-16, the total number of buses in operation was 220 and it increased to 230 in the year 2016-17. A continuous fall in the public bus ridership is evident from the data. A continuous fall in the public bus ridership is evident from the data. The bus ridership has declined from 28.2 million in the year 2012-13 to 18.7 million in the year 2016-17. The total bus kilometers operated is almost similar in all these years. Operating income increased to INR 314.6 million in the year 2014-15 from INR 246.2 million in the year 2012-13. The operating income started to decline after the year 2014-15 and reached INR 249.7 million in the year 2016-17. The operating losses have increased from INR 38.9 million (2012-13) to INR 96.3 million (2016-17). The total losses have increased to INR 123.4 million in 2016-17 from INR 85.3 million in 2012-13. This study shows twin financial problems of declining income and increasing losses.

The Urban Transport Directorate (UTD) provides a viability gap funding to LCTSL from the urban transport fund created by the state government. UTD was formed after the JnNURM scheme asked each state government to form a Unified Metropolitan Transport Authority (UMTA) to oversee all transport related decisions in the state and cities. LCTSL applies for viability gap funding to the UTD, which further sends it to the State Urban Development Authority (SUDA) to issue the funds. SUDA provides the necessary funds to LCTSL after the due approval from the Urban Development Department, GoUP. UTD is also responsible for reviewing the performance of LCTSL. However, there is no record of the regular meeting to review the performance of LCTSL. LCTSL officials claim that the last review meeting held in the year 2012. Another major finding is that the officers appointed for the post of Joint Director in UTD are transferred to other departments in one month's time. Therefore, it is practically impossible to review the performance of LCTSL.

Table 3: Financial performance of LCTSL for the years 2012 to 2017

Parameters	2012-13	2013-14	2014-15	2015-16	2016- 2017
Passengers (in million)	28.2	28.2	25.7	20.9	18.7
Bus Kilometers (in million)	14.2	14.6	15.1	14.6	14.2
Income (million INR)	246.2	302.6	314.6	293.8	249.7
Operating Expenses (million INR)	285.2	344.6	366.4	367.6	346.0
Operating Loss (million INR)	-38.9	-42.1	-51.8	-73.7	-96.3
Other Expense (million INR)	46.4	38.7	33.7	29.5	27.0
Total Loss (million INR)	-85.3	-80.7	-85.6	-103.2	-123.4
Income Per kilometer (INR)	17.3	20.7	20.8	20.2	17.5
Operating Cost per kilometer (INR)	20.1	23.6	24.2	25.2	24.3
Total cost per kilometer (INR)	23.3	26.2	26.5	27.2	26.2
Operating loss per kilometer (INR)	-2.7	-2.9	-3.4	-5.1	-6.8
Total loss per kilometer (INR)	-6.0	-5.5	-5.7	-7.1	-8.7

(Source: LCTSL office)

5.3.1. Comparison of public bus fares with auto-rickshaws

Fares for public transport services are decided by LCTSL with the approval of RTO. LCTSL provides three types of bus services - general, non-AC low floor and AC low floor bus. Flat fare system is followed for bus fares as a subsidy to the operator. LCTSL decides the flat fare assuming 22 days of bus operation instead of 30 days. It means that a user pays 73% (22/30) of its' actual fare in each trip. In case of auto-rickshaws, vikrams and e-rickshaws fares

are proposed by the unions and then RTO approves it. The operation of these IPT vehicles is on shared basis, which makes it affordable to the users. The seating capacity is 3 to 8 persons per vehicle (3-4 for auto-rickshaws and 6-8 for vikrams), which makes it comfortable for the users. Buses are very uncomfortable because people need to stand in the aisle of an overcrowded bus when all the seats are occupied. People prefer to use auto-rickshaws for its easy availability in terms of frequency (2 to 5 minutes in peak and off-peak hours) and accessibility (no fixed stoppages like bus stops), definite seating space, and competitive fare to a public bus. The comparison of public bus fares and auto-rickshaws is given in table 5. Users do not need to wait for another bus because of the frequent availability of auto-rickshaws. It is more cost effective option for the users. The frequency of buses and auto-rickshaws are between 2 to 4 and 10 to 30 per hour respectively. The approved list of auto-rickshaws' fare was last issued in the year 2013 by RTO, but with time auto-rickshaw unions has increased the fares without the approval of RTO. This unofficial increase in fare has caused discomfort to the users because the user has to pay the unreasonable fare asked by the auto-rickshaw driver. The list of fares for auto-rickshaws presented in table 4 shows the unofficial list based on the interviews of auto-rickshaw drivers.

Table 4: Comparison of public bus fares with the fare of auto-rickshaws

Fare Chart (in INR)					
Public Bus				**Auto Rickshaws**	
Kilometers	**General Services fare**	**Non AC services (Low Floor) fare**	**AC Services(Low Floor) fare**	**Kilometers**	**Fare**
0-3	5	10	15	0-3	5
3.1-6	10	10	20	3.1-4	8
6.1-10	15	15	25	4.1-6	10
10.1-14	20	20	35	6.1-8.0	15
14.1-17	25	25	35	8.1-10	20
17.1-20	30	30	40	10.1-12	25
20.1 to above	35	35	45	12.1-15	30

(Source: LCTSL website and auto-rickshaw driver interviews)

It is necessary for IPT services to act as a feeder service to the public bus service for an efficient public transport system in the city. The function of IPT services may change in the absence of public transport service in a city and it can function as a main mode of public transport. In case of Lucknow, the competition created by the auto-rickshaws (in terms of the easy availability and similar travel cost) is adding to more financial losses for the public bus system. Another factor is the negligence of traffic management and regulation by the traffic police and RTO, Lucknow. The total number of registered auto-rickshaws is approximately 5000 but the number of unregistered auto-rickshaws operating in the city is much higher. The approximate number of unauthorized auto-rickshaws operating in the city is estimated between 15,000 to 20,000. This negligence has also increased direct competition for public bus system with unregistered auto-rickshaws.

6. Findings and concluding remarks

This paper has studied the operational dynamics of the public bus system majorly on four criteria: understanding of the existing governance mechanism, financial performance of LCTSL, competition with the IPT modes, and travel cost based on the comparison of public bus and auto-rickshaw fares. It is evident from the study that there is minimal integration between the organizations for different modes of transport in the city. Every organization is functioning independently. Therefore, integration of IPT modes as the complementary last mile connectivity to public bus services is replaced with the increasing competition between IPT and public transit modes. All transport

modes are competing with each other without appropriate monitoring and regulation from the public institution. It also indicates lack of willingness of organizations to standardize public bus system as the main mode of transport. The public bus system has become the least choice of transport mode due to the longer headways. The reason behind longer headways is an insufficient number of buses in the city. The public bus transport standard suggests that there are minimum 400 buses required per 1 million population (Singh, Juyal, & Singh, 2017). Lucknow city needs approximately 1200 buses to serve its' population, but the city only operates 220 buses. The availability of buses at 5-10 minutes' headways will increase the use of public transport.

The existence of an umbrella institution for urban transportation in the form of the Urban Transport Directorate (UTD) has not been fully exploited. It should perform more responsibility instead of only providing viability gap funding to loss-making LCTSL. The state government needs to focus on removing the uncertainties with the post of Joint Director at UTD. It is difficult to understand the problems of the urban transport system in the city without a significant time in administration. The role of the UTD is very important for integration of all modes into a working system. Another reason for this miserable situation is the uncertainty related to the short tenure of administrative officers. The ongoing practice of transferring every officer within one-month tenure is creating a bottleneck for administration and quality control. The officers do not get enough time to settle in one department, review the performance and take appropriate policy decisions.

The role of RTO is to regulate the city's transport, but it shows that this organization is not able to perform its duties. It is not able to prevent the increase in the number of unauthorized auto-rickshaws. This increase in the number of unauthorized auto-rickshaws results in more competition with public bus. It is necessary to remove these auto-rickshaws. The removal of these auto-rickshaws will also help in increasing mode share of public buses. Traffic police which report to RTO is under Traffic Police Directorate, which is a different organization. The disintegration of these organizations is also a matter of concern. RTO does not have its' own manpower to regulate the traffic.

Travel cost is important in deciding a transport mode over another. Therefore, the fares of public bus also need to be revised to become cheaper than auto-rickshaws. Also, the unofficial increase in fares of auto-rickshaws by the unions causes discomfort to the users. The chances of dispute are very less in the case of fixed fare transport modes and people prefer to use these modes. Public bus has this advantage over auto-rickshaws.

In the Indian context, this study can help other Indian cities which are facing similar problems due to the fragmented institutional framework for public transport services, low public transport modal share and financial losses to the public bus operators because of the direct competition from IPT services or private bus services.

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