

## **URBAN BUS REFORM TYPES: BRIDGING THE MOBILITY GAP**

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### **ABSTRACT**

Mobility is becoming increasingly essential in large cities as a consequence of its impact on social, economic and geographic development. The combination of rapid economic growth couple with the increasing population and the corresponding increase in demand for transport in recent times has aggravated the mobility problems in major metropolitan regions of the world. This paper highlights the problems of the informal sector operations in the city which include but not limited to unreliable services, irregular frequency, poor coverage, unpredictable fares amongst others. Objectives of urban transport reform, components of urban transport reform and reform types are emphasized to underpin what any city transport authority planning to implement bus reform should be looking out for in the course of execution. Data were collected through secondary source. The paper draws conclusion on the influencers of the choice of urban bus transport reform type.

**Keywords:** Mobility, Public Transportation, Bus Reform, Cities, Authority, Minibuses.

### **INTRODUCTION**

Cities have been facing numerous challenges in the fields of housing, infrastructure, transportation, energy and employment, as well as other basic services such as education and health care. Amongst such challenges, transportation emerges as a key issue [1]. Mobility is an essential component in the life of any urban dweller. Mobility is needed to work, to enjoy free time, to travel, to live etc. However, the current situation in most cities around the world is far from optimising. Ever-recurring traffic jams, inadequate public transport, air pollution, car accidents, and rising car ownership rates are few examples of how cities are dealing with such an issue. Furthermore, high transport costs hinder cities' productivity and competitiveness, obstructing poverty-reduction endeavours and becoming a community health hazard in terms of safety and environment [2]. In most developing countries, the upgrade of mobility in cities necessarily hinges upon enhanced efficiency in public transportation. To be more precise, cities must increase the quality of public transportation systems in order to improve their citizens' mobility. There are various studies discussing how cities should reform their transportation system, or even how a bus reform should be implemented. In improving the mobility of urban dwells would require a comprehensive development of intermodal transport system. However as a result of paucity of funds in the public frequency time constraints for public officer holders', the fastest intervention of any transport reform would actually focus on the bus transport subsector. Nevertheless, there is inadequate studies, with a focus on the informal transport sector that will integrate political office holders' ambitious, funding mechanism amongst others. This paper will therefore focuses on the elements of bus reform especially in developed and developing countries. A general concepts of public transport system reforms will be used in the study and to understand the current situation of the systems.

## PROBLEMS OF URBAN INFORMAL BUS SYSTEM

As cities continue to become more dispersed, the cost of building, operating and mobility for public transportation systems increases. For instance, in 2015 about 201 urban agglomerations had a subway system, majority being in developed countries. Furthermore, dispersed residential patterns characteristic of automobile dependent cities makes public transportation systems less convenient to support urban mobility. In many cities, additional investments in public transit did not result in significant increase in ridership. Unplanned and uncoordinated land development has led to rapid expansion of the urban periphery. Residents, by selecting housing in outlying areas, restrict their potential access to public transportation. Over-investment (when investments do not appear to imply significant benefits) and under-investment (when there is a substantial unmet demand) in public transit are both complex challenges. Urban bus transport is often perceived as the most flexible transportation mode for urban areas, notably large cities. Most urban transit developments had little, if any, impacts to alleviate congestion in spite of mounting costs and heavy subsidies. This paradox is partially explained by the spatial structure of contemporary cities which are oriented along servicing the needs of the individual, not necessarily the needs of the collectivism. Thus, the automobile remains the preferred mode of urban transportation in some high income cities. In addition, public transit is publicly owned, implying that it is a politically motivated service that provides limited economic returns. According to the World Bank urban transport toolkit [3], there are common problems faced by bus systems around the world which necessitated the need for a reform: Among them:

- **Too few buses or inadequate service capacity.** On main urban routes, waiting times of more than 10 to 15 minutes during the normal working day may be seen as excessive. Overcrowding occurs when every bus operating in the direction of peak traffic flow carries more than its permitted maximum load. This is as a result of few buses operating as against the required number of buses expected.
- **Unreliable service.** There are two main aspects of reliability: firstly whether a service operates at all, and if it does whether it operates on schedule. Second is the reliability of the vehicle frequent mechanical failure will impact considerably from service reliability. Unreliable service can be seen as a major problem because it tend to send wrong signals to captive riders.
- **Irregular frequency.** Irregular and unpredictable service frequencies make a bus service less convenient and may sometimes be a serious problem. Where services are operated according to the determined schedule, a divergence of no more than three minutes from the scheduled time for at least 90% of journey is normally acceptable on urban services.
- **Poor route coverage.** A problem in many cities, particularly rapidly growing ones, is that bus service in some areas of the city are poor or even non-existent. Routes coverage may be measured in terms of the percentage of urban area within 500 metres of a bus stop.
- **Excessive transfer requirements between routes.** Some bus systems are designed on the “hub---and---spoke” principle, which intentionally requires a high proportion of passengers to interchange at one or more focal points. As long as services provided do not have connections with good interchange facilities and through- ticketing, etc., passenger suffer lot of inconveniences.
- **Excessive fares.** Paying for public transport often accounts for a significant proportion of household spending for those on low income, and the level of fares is often a sensitive political issue. Where a large number of passengers have difficulty affording bus fares, the fare may be regarded as excessive in the sense that they are at

the minimum level of covering the full cost of providing an efficiently operated bus service. If passengers cannot afford the fare in such a situation, the basic choice is between reducing service standards to an affordable level and providing a subsidy. Restricting fares to an affordable level without subsidy and without reducing standards, will make the service unsustainable.

- **Poor quality vehicles:** A common complaint is that the quality of buses used to provide the service is poor especially in the developing countries. Dilapidated vehicles are seen plying major roads which make passengers very uncomfortable. There are two aspects of vehicle quality: the specification of the vehicle and the standard to which it is maintained. Vehicle specification may be very basic, providing the minimum acceptable level of passenger comfort and convenience. Or it may include features such as air conditioning, reclining seats or provision for easy access by disabled passengers, including those in wheelchairs.
- **Poor safety performance:** An estimated 75% to 85% of fatalities in road accidents worldwide occur in developing countries, despite low level of car ownership. A significant proportion of road accidents involve public transport vehicles. The number of kilometre per accident is a measure of safety. Accidents are mainly caused by poor driving and to a lesser extent, poor vehicle condition due to poor maintenance. Road conditions are a major cause of road accidents as well as the failure of drivers to regulate their speed in accordance with road condition.
- **Traffic congestions caused by buses:** This is often the case where services are unregulated and provided by a large number of small operators, particularly when small vehicles are used. Compared to private transport, buses required less road space per passengers, and should therefore cause less congestion. However, excessive dwell times, poor driving, inappropriate vehicle size or type, and an excess of vehicles often result in increased congestion. Where many small vehicles are used, instead of fewer larger buses, more road spaces required per passenger and this can contribute to congestion. If there are too many vehicles in the system, this often creates congestion near terminals, and buses may have to queue in the surrounding streets.
- **Poor passengers' management:** Poor passenger's management by bus crew is a common complaint. Passengers are forced to board vehicles that are already overloaded, overcharged or ejected from the bus before their destination so that the bus can turn around and carry a more profitable load in the opposite direction. Such treatment is particularly common where bus crew have an incentive to maximize the fares collected and where rules and regulations are inadequately enforced.

## ANTECEDENT / HISTORICAL DEVELOPMENT OF TRANSPORTATION

The history of transport is largely one of technological innovation. Advances in technology have allowed people to travel farther, explore more territory, and expand their influence over larger and larger areas. Even in ancient times, new tools such as foot coverings, skis, and snowshoes lengthened the distances that could be travelled. As new inventions and discoveries were applied to transport problems, travel time decreased while the ability to move more and larger loads increased. Innovation continues by transport researchers are working to find new ways to reduce costs and increase transport efficiency.

The first earth tracks were created by humans carrying goods and often followed trails. Tracks would be naturally created at points of high traffic density. As animals were domesticated, horses, oxen and donkeys became an element in track-creation. With the growth of trade, tracks were often flattened or widened to accommodate animal traffic. Later,

the travois, a frame used to drag loads, was developed. Animal-drawn wheeled vehicles were probably developed in the Ancient Near East in the 4th or 5th millennium BC and spread to Europe and India in the 4th millennium BC and China in about 1200 BC. The Romans had a significant need for good roads to extend and maintain their empire and developed Roman roads.

In the Industrial Revolution, John Loudon McAdam (1756–1836) designed the first modern highways, using inexpensive paving material of soil and stone aggregate (macadam), and he embanked roads a few feet higher than the surrounding terrain to cause water to drain away from the surface. With the development of motor transport there was an increased need for hard-topped roads to reduce wash away, bogging and dust on both urban and rural roads, originally using cobblestones and wooden paving in major western cities and in the early 20th century tar-bound macadam (tarmac) and concrete paving were extended into the countryside.

The modern history of road transport also involves the development of new vehicles such as new models of horse-drawn vehicles, bicycles, motor cars, motor trucks and electric vehicles.

## **REFORM OBJECTIVES**

The objectives of reform are usually spelled out only in the broadest terms with perhaps just two or three key objectives being clearly specified. In recent years the key objectives in most cities have been:

- To fill urban mobility gap
- Formalization of existing informal operations
- Social (to enhance city life)
- Environmental regeneration (pollution reduction)
- Political

While these key objectives give a clear direction for reform, they leave considerable flexibility when it comes to bus system details. There are a wide range of operating structures to choose from.

## **LITERATURE REVIEW/CONCEPTUAL FRAMEWORK**

### **Utility Theory**

The concept of utility theory suggests that consumers choose an alternative which possesses a set of characteristics which maximizes the benefit derived by the consumer [4]. Transportation studies often assume that travellers derive no utility from the trip itself, but rather travel to achieve other goals (i.e. work, shopping, education etc.) Thus, travel consumers are modelled not as utility maximizers, but instead as disutility (or generalized cost) minimizers. Disutility of transit travel has the following components [5]: access time to transit service, waiting time, in-vehicle time, transfer times (where applicable), egress times and fares. Typically, the relative contribution to overall disutility of these individual attributes is expressed by a weighted, linear sum of the attributes [6]. For example, most studies suggest that passengers perceive waiting time and transfer time to be more onerous than in-vehicle travel times. Utility theory has long been used in mode choice models to predict transit ridership. When choosing between competing modes (typically transit and auto), a traveller's propensity to choose a given mode is a function of the relative generalized costs, or disutility, of the competing modes. Often, logit or probit models are used to compute the probability of choosing a mode amongst a set of candidate modes based on a comparison of their generalized costs [7]. These models are often employed at the regional level as part of travel

forecasting work. Utility models have been employed to assess the impacts of potential changes in transit services on transit ridership in regional corridors. The current paper builds upon on the existing literature in several ways.

## **METHODOLOGY**

There are three types of research employed in this study exploratory, descriptive and explanatory. The first one has the objective of clarifying concepts and ideas in order to formulate hypothesis for future studies. On the other hand descriptive research aim at describing characteristics of a population, phenomenon and relationship between variables.

### **Data Sources**

The data for the study were sourced from secondary data. Secondary data were sourced from various levels of government agencies studies and projects report sourced from the internet.

## **COMPONENT OF BUS REFORM**

A typical bus reform involves the followings:

### **Formalization**

Formalization is effectively the registration of the informal transport associations and their members by the transport authority or registrars in terms of uniform constitution and code of conduct. In formalizing provision would be made for provisional registration of associations and their members who comply with all the relevant provincial criteria. This is an entry mechanism to allow operators into the formalisation and regulation phase. Full registration of an association and its members is only granted when all operators have operating licences.

### **Regulation**

Regulation is effectively the phase in which operator obtain, and are regulated in terms of their permits or operating licences. In this process the regulatory authority makes provision for the conversion of the old permits to operating licences, where the latter are routes as opposed to radius-based, with a validity years.

### **Recapitalisation**

Formalised and regulated operators with valid-based operating licences are eligible to enter the recapitalisation process. They also have the option to exit the industry at a number of points before a formal agreement is signed with the consortia. The recapitalization process allows operators with route-based permits to apply for recapitalisation, so as not to delay their application.

## **STEPS IN THE IMPLEMENTATION OF BUS REFORM**

### **Make a diagnosis and evaluate the bus system**

To evaluate the bus system, the toolkit suggests three steps. Firstly, the city should review the most common problems affecting bus systems. Secondly, an evaluation with specific KPIs should be done. Finally, the factors that influence the bus systems' efficiency should be analysed.

### Defining the transport objectives of the city

After having performed a thorough analysis of the system, the second step is identifying the objectives of the reform. The objectives could be financial in case the system is suffering from solvency problem; operational; or service related as when citizen constantly express their dissatisfaction at the current conditions. Such problems tends to emerge in industries where bus services are being provided by a large number of private sector operators with no coordination, where there is absence of competition, or an inefficient state owned operator. The need for a reform might also be triggered by a social motivation, e.g. to improve affordability, accessibility, or to implement more ecologically minded services.

### Choosing the reform type

After stating specific objectives of the reform it is important to take a critical look at types of reforms and the one that best suit the stated objectives. [3], eight types of reforms options were proposed. These are summarized in the table below.

**Table 1: Reform Types**

s/n	Reform Types	Definition	Disadvantages	Reform is appropriate if Authority wishes to:
1	Route contract: Net cost	This is when an authority issues a contract for the operation of one specified route or a specified group of routes, it's described as a route contract. Under a net-cost contract the operator provides a specified service for a specified period and retains all revenue	<p>The authority may have to pay more for a net-cost rather than a gross-cost contract since the operator usually makes very conservative estimates of revenue to reduce his financial risk.</p> <p>The authority's ability to make essential changes to the network are restricted if they adversely affect the revenue of pre-existing net cost contracts.</p> <p>Fewer operators usually bid for net-cost as opposed to gross-cost tenders.</p> <p>There is a possibility of encouraging on-street competition for passengers on streets where more than one company operates</p>	<p>Have mandatory retendering after a certain number of years.</p> <p>Establish a sustainable procedure to constantly test the market to achieve the lowest costs.</p> <p>Determine the routes and daily schedules.</p> <p>Be identified as the bus system provider.</p> <p>Take full responsibility for service planning.</p> <p>To avoid involvement in setting operators profit levels.</p> <p>Offer opportunity to smaller operators to participate.</p>
2	Route contract: Gross cost	A gross-cost contract pays the operator a specified sum to provide a specified service	The operator has no direct incentive to ensure revenue collection	Avoid on-street competition for passengers

		<p>for a specified period. All revenue collected is for the authority.</p>	<p>The authority must ensure that all revenues are being collected and handed over, requiring constant vigilance and inspection</p> <p>Penalties must be in place both for passengers who do not have tickets and staff who fail to issue tickets</p> <p>The operator is not concerned with the efficient operation of the route</p> <p>As this option places the greatest demands on the authority it requires the highest staff numbers</p> <p>All service improvements are initiated by the authority which may result in a very conservative approach</p>	<p>Establish a sustainable procedure to constantly test the market to achieve the lowest cost</p> <p>Avoid the need to apportion off bus revenues between operators</p> <p>Provide free or discounted interchange between all routes</p> <p>Avoid discrimination against concession fare passengers, and Collects a high percentage of revenue off-bus</p>
3	Unregulated entry with quality control	<p>Allow free entry to the public transport market, subject only to a requirement that the vehicles used meet a specified set of standards.</p>	<p>The vacuum of control by the authority is usually filled by criminal elements.</p> <p>Service is normally concentrated on the major route corridors causing severe congestion, and poor services on less busy routes.</p> <p>This system is usually accompanied by dangerous driving by drivers attempting to maximize passenger loads.</p> <p>Members of the public without other means of transport have no assurance that service will be provided where and when they need it.</p>	<p>The authority does not have the expertise to plan and implement a more ordered system, but wishes to keep some control over the safety and quality of vehicles employed.</p> <p>The authority does not have the legal framework enforce a more ordered system.</p> <p>The authority requires a large amount of capacity to be placed in service in a short timeframe.</p> <p>The authority has a political directive to do so.</p> <p>The authority wishes to offer employment or investment</p>

				<p>opportunities to individuals and smaller operators.</p> <p>Public transport provision is not an important mode of transport.</p>
4	Unregulated entry without quality control	Allow free entry to the public transport market, without any requirement that the vehicles used meet any standards other than normal vehicle type approval	<p>The vacuum of control by the authority is usually filled by criminal elements.</p> <p>Service is normally concentrated on the major route corridors causing severe congestion, and poor services on less busy routes.</p> <p>Members of the public without other means of transport have no assurance that a service will be provided where and when they need it.</p> <p>The absence of a quality standard makes it difficult to ensure public safety.</p>	<p>The authority does not have the expertise to plan and implement a more ordered system.</p> <p>The authority does not have the desire or the ability to enforce vehicle quality standards.</p> <p>The authority does not have the legal framework enforce a more ordered system.</p> <p>The authority requires a large amount of capacity to be placed in service in a short timeframe.</p> <p>The authority has a political directive to do so.</p> <p>The authority wishes to offer employment or investment opportunities to individuals and smaller operators.</p> <p>Public transport provision is not an important mode of transport.</p>
5	Area contract: Gross cost	This is when an authority issues a contract to a bus operator giving him the exclusive right to operate bus services in an area that forms all or a substantial part of a	The operator does not keep the revenue collected and so may not pay sufficient attention to revenue collection.	The city has a number of relatively self-contained areas. (If the total number of buses in the city is fewer than 500 then



		city.	<p>The authority must ensure that all revenues are being collected and handed over, requiring constant vigilance and inspection.</p> <p>Penalties must be in place both for passengers who do not have tickets and staff who fail to issue tickets.</p> <p>The operator is not concerned with the efficient operation of the route.</p> <p>Since the number of buses involved is relatively large, the number of bidders is likely to be small.</p> <p>It's difficult to replace a poorly performing operator since a large fleet of buses is involved.</p>	<p>there should be only one citywide area.)</p> <p>The authority wishes the operator to undertake bus service planning for the area (normally this would be subject to approval by the authority).</p> <p>The authority wishes the operator to establish himself and be identified as the bus system provider for the area.</p> <p>The authority wishes to avoid on-street competition for passengers.</p> <p>The authority wishes to provide free or discounted interchange between all routes in all areas in order to minimize route duplication</p> <p>A high percentage of revenue is collected off-bus.</p>
6	Area contract: Net cost	This is when an authority issues a contract to a bus operator giving him the exclusive right to operate bus services in an area that forms all or a substantial part of a city. Under a net-cost contract the operator provides a specified service for a specified period and retains all revenue.	<p>There is a possibility of encouraging on-street competition for passengers on streets where more than one company operates.</p> <p>Sometimes it's difficult to decide which operator should operate routes that cross two or more areas.</p> <p>The authority may have to pay more for a net-cost rather than a gross-cost contract since the operator usually makes very conservative estimates of revenue to reduce his financial risk</p>	<p>The authority wishes to give an incentive to the operator to increase ridership and revenue.</p> <p>The authority wishes to give the operator some flexibility to amend routes and schedules to make the network as attractive and efficient as possible.</p> <p>A small percentage of revenue is collected off-bus.</p>

			<p>The authority's ability to make essential changes to the network are restricted if they adversely affect the revenue of pre-existing net-cost contracts.</p> <p>Since the number of buses involved is relatively large, the number of bidders is likely to be small.</p> <p>It's difficult to replace a poorly performing operator since a large fleet of buses is involved.</p>	<p>Sharing off-bus revenue is not seen as a problem.</p> <p>The authority wishes to fix the absolute amount of subsidy.</p>
7	Private Monopoly	<p>A private monopoly is an area contract awarded to a private sector operator. The area may cover an entire urban area or a substantial part of it.</p>	<p>Absence of competition often results in poor service.</p> <p>As a private agency the operator cannot voice opposition to political edicts even where these are detrimental to bus operations.</p> <p>Increases fare at any time without consultation.</p> <p>There is a tendency for the operator to become more powerful than the regulatory authority.</p>	<p>Government is not interested in investing in the bus industry.</p> <p>An exclusive franchise or operating right to a route or area cannot be enforced.</p> <p>Previous attempts to improve the services provided by public sector operators have failed, for reasons beyond the authority's control. For example, because of criminal activities or failure by government to fulfil its obligations.</p>
8	Public Monopoly	<p>If all bus services within a city or urban area are provided by one publicly-owned undertaking it's a public monopoly.</p>	<p>Absence of competition often results in poor service.</p> <p>Conforming to government guidelines for staff terms and conditions often results in over-staffing with high salary costs.</p> <p>As a government agency the operator cannot voice opposition to political edicts even where these are detrimental to bus operations.</p>	<p>No private companies are interested in investing in the bus industry.</p> <p>An exclusive franchise or operating right to a route or area cannot be enforced.</p> <p>Previous attempts to improve the services</p>

			<p>Public monopoly operators are often unable to secure adequate fare increases, or to secure funds for investment in new buses.</p> <p>There is a tendency for the operator to become more powerful than the regulatory authority.</p> <p>Frequent management changes will result in poor continuity within the organization.</p> <p>The management team is limited in its powers since most of the staff remain on local government terms and conditions.</p>	<p>provided by private sector operators have failed, for reasons beyond the authority's control. For example, because of criminal activities or failure by government to fulfil its obligations.</p> <p>There is a desire to bring in professional management while retaining ownership of the assets.</p> <p>There is a desire to introduce some competition for the right to operate the system.</p>
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Source: Urban Tool Kit, [3]

## CONCLUSION

The type of bus reform that would be implemented in any urban city is dependent on a number of factors which comprises and not limited to the followings:

- The commuting population size of a city and the length of distances travelled
- The socio-economic structure of the city
- The political inclinations of the political office holders
- The local union's buy-in and acceptance
- Availability of funds; the government may decide to acquire the rolling-stock and lease them to the private sector whilst the participating private sector provided equity participation towards their involvement in the scheme.
- Finally, it is important to structure the transition from informal to formal operations. This transition may involve the breaking up of a large monopoly into several smaller operator, or it may require many small operator turning operating into units of sufficient size to be eligible to bid for route on area contract, or a complete out-sourcing of the operations to the private sector.

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Dr. Desmond Amiegbebhor has been involved in the management of transport operations for over 24 years with educational background in Transportation Operations Planning and Urban Transportation Geography from the Federal University of Technology Owerri and University of Nigeria Nsukka (UNN) respectively. Dr. Desmond has garnered varied experiences in Public Transport Operations spanning from Associated Bus Company (ABC) Transport Plc from 1993 to 2007 leaving as the General Manager of the organisation. He is the Director of Bus in Lagos Metropolitan Area Transport Authority.

He is a Fellow of the Chartered Institute of Logistics and Transport UK, Alumni Harvard Business School and a Faculty Member Lagos State University. He is a vested transport professional with leading roles in Transport Operations Management, Transport Service Planning and Transport Researches. He has published over ten editorial topical transport issues in both local and international journals. He has extensive experience in the Development of Public Transport Operations, Transport planning for fleet deployment and Management.

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Olufemi Amure is a native of Ondo State, born in Lagos on the 11<sup>th</sup> of July 1976. Attended school in Lagos. She had her B.Sc. Geography and Planning from the Lagos State University, M.Sc. Geography from the University of Ibadan and currently a PhD student in the University of Lagos majoring in Transport Geography. She presently work for the Lagos Metropolitan Area Transport Authority as the Bus Planning Specialist. She is a member of Chartered Institute of Logistics and Transport, The Chartered Institution of Highways and Transportation, Association of American Geographer and Association of Nigerian Geographer. She is married and bless with children. Outside current employment she is a volunteer research officer with the Gender Research and Development Centre (GERDEC).