

THE ROLE OF BUS RAPID TRANSIT IN IMPROVING PUBLIC TRANSPORT LEVELS OF SERVICE, PARTICULARLY FOR THE URBAN POOR USERS OF PUBLIC TRANSPORT: A CASE OF CAPE TOWN, SOUTH AFRICA

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ABSTRACT

The current level of service provision of public transport in Cape Town, as in other cities in South Africa, is inadequate and ineffective in meeting user needs. The 'current (very limited, modally fragmented) commuter based service' is characterized by poor performance in terms of travel times, reliability, capacity, safety and security. The aim of this paper is to describe the study to assess the potential role of BRT in improving public transport levels of service, particularly for the urban poor users of public transport in Cape Town.

A comparative analysis of current levels of public transport services versus predicted BRT-based IRT service levels was carried out to establish the changes that can be brought about to public transport level of service through changing to the BRT-based IRT system. The level of service measures that were examined include: walking, in-vehicle and trip distance; walking, waiting, in-vehicle and trip time; in-vehicle and trip speed; fare cost; and transfer requirement. The results indicate that the BRT-based IRT system is not clearly beneficial to the urban poor in the area of service levels improvements. While the poor commuters may benefit from more accessible, frequent and fast IRT services as well as reduced travel times, ironically, these will be more expensive and in some cases unaffordable to them and therefore of no benefit to them. In order for the urban poor users of public transport to reap the full potential benefits of BRT, it is recommended that appropriate measures to rationalize the BRT-based IRT system be adopted.

1 INTRODUCTION

The current level of service provision of public transport in Cape Town, as in other cities in South Africa, is inadequate and ineffective in meeting user needs (CoCT, 2010a; CoCT, 2010b). The current public transport service is characterized by poor performance in terms of reliability, capacity, safety and security and so on (CoCT, 2006). The foregoing severe shortcomings of the existing public transport service barely meet the definition of a system, and create daily hardship for thousands of residents, especially poorer communities living far from major centres of employment, and higher order commercial and social facilities (Creamer Media's Engineering News, 2009). This segment of the urban population –

which, invariably, is 'captive' to public transport – not only has to put up with the poor standard of public transport services, but is also relatively overburdened by long journey times as well as high distance-related transport costs which have an adverse impact on meagre family incomes (Behrens *et al*, 2004; CoCT, 2006).

BRT has been defined in BRT Implementation Guidelines as a *flexible, high performance rapid transit mode that combines a variety of physical, operating and system elements into a permanently integrated system with a quality image and unique identity* (Levinson *et al*, 2003 cited in Diaz *et al*, 2004 and Diaz, 2009). It is important to note that BRT is the latest "buzz word" within the public transit community and has been promoted as the economic and practical solution to improving existing public transport systems (Jarzab *et al*, 2002; Wright, 2004). Moreover, it is increasingly becoming a global phenomenon synonymous with quality public transport (CoCT, 2006 and 2008).

Actually, the trend towards the implementation of public transport level of service improvement programmes based on BRT technology that incorporate existing paratransit operations has been occurring dramatically in a number of cities around the world, particularly in Latin America (Schalekamp *et al*, 2009; Wright, 2004). Drawing inspiration from these global developments, the city of Cape Town (among other South African cities) has, of late, planned an Integrated Rapid Transit (IRT) system that also relies on the introduction of BRT and incorporates existing formal bus and paratransit operations. This national initiative emerged in 2006, coinciding with the announcement of South Africa as host of the 2010 FIFA World Cup, as a renewed thrust to revitalize public transport (Schalekamp *et al*, 2009).

The purpose of the study was to inquire on the public transport level of service changes which may be brought about by BRT, particularly for the urban poor users of public transport in Cape Town. The study focused on the effect on walking, in-vehicle and trip distance; walking, waiting, in-vehicle and trip time; in-vehicle and trip speed; fare cost; and transfer requirement of the change to the BRT-based IRT system. However, it is important to stress that limiting the study to a few attributes of system performance has disadvantages in terms of the general applicability of results.

2 LITERATURE REVIEW

2.1 Typical transport problems of poor populations in developing world cities

Literature makes it clear that there is a continuing problem in respect of the access and mobility of the urban poor, i.e., restricted transport modal choice; unacceptable travel conditions; high transport expenditure; long commuting distances and travel times; vulnerability to traffic accidents, crime and overcrowding and so on (Behrens *et al*, 2004; Diaz *et al*, 2007; Sohail *et al*, 2005).

It is particularly important to note that the poor's modal choice is limited to public transport only (Sohail, 2005). It is therefore the poor who are most affected by the lack of adequate and affordable public transport provision (Sohail *et al*, 2005). It should also be noted that the White Paper on National Transport Policy of 1996 and the Moving South Africa (MSA) of 1999 presented a policy and strategic framework for urban passenger transport provision in which one of the central concerns may be interpreted as: the prioritization of the provision of public transport (and Non-motorized transport) to address the access and mobility needs of the more disadvantaged sectors of the population including the poor (NDoT, 1996 and 1999 cited in Wilkinson, 2008).

The following section touches on how the above-mentioned transport problems impact on the livelihoods of the urban poor.

2.2 Consequences of the urban poor's transport problems on their livelihoods

High public transport costs faced by the urban poor;

- Take a disproportionate share of their households' meagre incomes;
- Reduce their access to basic needs (i.e., the need for employment, health, education, water and energy supplies);
- Tend to add to their households' travel and economic difficulties ; and
- Reinforce the tendency of the urban poor to remain in their own districts, as a survival strategy to face economic crisis, and therefore increases the vulnerability of the poor by hindering their building up of labour, human and social capital assets (Diaz *et al*, 2003; Diaz *et al*, 2007). This condition leads to the reproduction and perpetuation of their poverty (Diaz and Godard, 2000).

Put in much simpler terms, the socio-economic exclusion of the urban poor, due to high transport costs, will contribute to their poverty and trap them in poverty vicious cycles (Diaz and Godard, 2000).

Long commuting distances and travel times faced by the urban poor have a negative impact on their human capital and productivity, since they induce fatigue and boredom, and use up both time and energy that could be spent on productive activities (e.g., spending time with family, income generation activities and so on) (Diaz *et al*, 2003).

Vulnerability to traffic accidents of the urban poor

Traffic accidents hurt the poor the most (Sohail, 2000). According to the Transport Research Laboratory (2002), the poor are particularly vulnerable to the shocks in their livelihoods created by traffic accidents. For example, the injury or death of a breadwinner is most likely to be a considerable internal shock which would impact negatively on the livelihood of the poor household (Transport Research Laboratory, 2002).

Vulnerability to crime and overcrowding of the urban poor

Booth *et al* (2000) assert that crime and the fear of it will impact negatively on the livelihoods of the urban poor in a number of ways. This, together with the problem of overcrowding (causing physical discomfort), is particularly so for poor women. There is therefore a need to make public transport safer and less overcrowded so that women's economic, educational and social opportunities are not adversely affected (Booth *et al*, 2000).

2.3 The crucial role of public transport in the lives of the urban poor

Public transport makes a significant contribution to the livelihoods of the urban poor as it provides them with the means to access employment and income-generation opportunities, education, health, and social networks such as extended families, which can help in securing incomes and necessary goods and services (Sohail *et al*, 2005).

According to Fox (2000) and Sohail *et al* (2005), the value of public transport in enabling the urban poor to have access to economic and social opportunities depends on accessibility, affordability and quality of the public transport services. Thus, the poor are expected to benefit from improved accessibility, reliability, travel times, affordability, frequency, capacity, safety and security (and so on) of public transport services (Fox, 2000; Sohail *et al*, 2005; Wright, 2004).

2.4 Appeal of BRT for developing world cities

As mentioned earlier, in most developing world cities, the urban poor rely/depend heavily on public transport for accessibility and mobility, and where there is a lack of accessible, adequate, affordable, safe, reliable public transport;

- There is a negative impact on the poor's livelihoods and therefore on their household incomes;
- The poor are unable to accumulate human, physical, financial, and social assets to break out of the poverty cycle; and
- The poor are kept physically, socially and economically isolated and trapped in poverty (Booth *et al*, 2000; Diaz *et al*, 2007).

There is, thus, an urgent need in many developing world cities to make improvements in public transport for the benefit of the poor (Fox, 2000). Wright (2004) asserts that BRT attempts to address deficiencies in current services by providing a rapid, high quality, safe and secure transit option which is a result of:

- Reduced travel times;
- Improved reliability;
- Upgraded human amenities;
- Improved safety and security;
- Improved identity and a quality image;
- Improved accessibility; and
- Increased capacity.

In short, BRT system elements contribute to transit objectives/ transit system performance, including reducing travel times, improving reliability, providing identity and a quality image, improving safety and security, increasing capacity and enhancing accessibility (Diaz *et al*, 2004; Diaz, 2009). Therefore, for cities in developing countries, BRT has much to recommend it. Most importantly, the urban poor may benefit substantially from the improved accessibility and high-quality service which BRT bring (Fox, 2000).

3 RESEARCH METHODOLOGY

The research included three steps namely, literature review, data generation and data analysis.

3.1 Literature review

A careful and systematic review of both local and international literature was undertaken to identify;

- i. Typical transport problems of poor populations in developing world cities and their consequences for the livelihood strategies of the urban poor (existing data on transport and the urban poor was analyzed to understand the situation);
- ii. The crucial role of public transport in the lives of the urban poor;
- iii. Problems and characteristics of public transport system(s) in developing world cities in general, and in Cape Town in particular (issues of access and quality were used to understand the prevailing conditions);
- iv. The appeal of BRT for developing world cities;
- v. BRT elements, system performance and system benefits as well as international experience with BRT system performance; and
- vi. The planned BRT-based IRT system of Cape Town (mainly local literature was used here).

3.2 Data generation

A comparative analysis of current levels of public transport services versus predicted BRT-based IRT service levels was carried out to establish the changes that can be brought about to public transport level of service through changing to the BRT-based IRT system.

3.2.1 *Data source and sampling method*

The main data source for the comparative analysis is the survey on travel patterns of households conducted for African Centre of Excellence for Studies in Public and Non-motorised Transport (ACET) in Cape Town during 2010. The database contains household socio-economic data (i.e., number of household members and their ages, car ownership, gender, occupation, relationships of household members with the youngest household member, physical characteristics of household members and general access to transport, transport usage, transport expenditure, household income and type of dwelling) and travel data including the trips made by household members on the previous day. The travel data included trip chains for the entire day together with the corresponding places they visited, modes used, cost incurred, time taken for a single complete trip and accompanying members in the trip. In the study, a data subset was extracted from the original dataset (comprising of 5473 trips of different types made by different transport modes) that conformed to the following criteria;

- Only trips by public transport (i.e., train, bus, and minibus taxi) were considered;
- Only commuter trips were considered.

From the data subset comprising of 866 public transport-based commuter trips, a sample of 100 public transport-based commuter trips was randomly selected for inquiry. The random number selection function on Microsoft Excel was used in their selection to ensure that each trip had an equal probability of being chosen. The sample size was considered to be large enough for the inquiry. The sample of 100 public transport-based work trips was then segmented based on income of the individuals who made the selected trips as follows; Less than R5499 (low-income); R5500 to R12500 (middle-income); and More than R12500 (high-income) comprising of 29, 37 and 14 persons respectively.

3.2.2 *Sample data generation method*

The data relevant for the inquiry retained on the sample dataset were walking times, waiting times, in-vehicle times, trip times, and actual number of transfer(s) and fare costs of the selected commuter trips made by the current public transport modes (i.e., train, bus and minibus taxi). However, it should be noted that the walking, waiting, in-vehicle and trip times are reported times, which might not be an accurate depiction of the service currently provided. Some form of data cleaning method was therefore employed to make the data more reliable in determining current public transport service levels. Demographic data such as income, age, gender, race as well as the main public transport mode used to make the trip were also retained.

Additional requisite sample data was generated through conducting a desktop survey. Some assumptions, tools (e.g., Google Earth Origin and Destination (O-D) search and route length measuring tools; Content analysis of the full BRT-based IRT route network map (which includes all phases etc) and methods were employed in the desktop survey to generate additional sample data such as;

- Approximate walking, in-vehicle and trip distances; and equivalent in-vehicle and trip speeds of the selected commuter trips made by the current public transport modes; and
- Estimated walking, waiting, in-vehicle and trip time; walking, in-vehicle and trip distance; in-vehicle and trip speed; transfer(s) requirement; and fare if the trip was made using the BRT-based IRT system

Of particular importance to note is that there were instances where estimated walking distances for IRT services (i.e., both BRT trunk and feeder services) were in excess of 1,500km as a result of the IRT routes being mostly too spaced out. It was, therefore, assumed that some other easily accessible services (which will not be part of the IRT system) will be made available in areas where there is no provision of feeder services within an access distance of 1,500km. This assumption was made so as to limit the estimated walking distances for IRT services to 1,500km. Furthermore, it was also assumed that the other-easily-accessible-services would take commuters to or from trunk or feeder services at an extra cost of R5. It should also be noted that BRT trunk and feeder service fares, for comparison purposes, were calculated using both the experimental flat IRT fare system (Cape Times, 2011a; Cape Times, 2011b) and the initially proposed distance-based IRT fare system, i.e., the IRT Full Fare System for 2011/12 until 31 Dec 2011. (For a detailed description of the assumptions, tools and methods employed in the desktop survey to generate additional sample data please see Maunganidze (2011)). The following subsection describes the steps taken to get the survey data to the analysis stage and the analyses conducted.

3.3 Comparative analyses method

For each of the 100 commuter trips, the differences between the estimated values for the BRT-based IRT system and the values for the current public transport system were calculated. The differences were calculated for the walking, in-vehicle and trip distance; walking, waiting, in-vehicle and trip time; in-vehicle and trip speed; fare cost; and transfer requirement values.

Calculation of summary values

The averages and standard deviations of the travel parameter values for the BRT-based IRT system and for the current public transport system were also calculated. The differences of the calculated average travel parameter values were then calculated and tabulated (together with the standard deviations) for the three income groups. Furthermore, the data was graphed to show the changes that would likely occur to the values of the travel parameters due to changing to the BRT-based IRT system.

Discussion and conclusions

The tabulated and graphed data were then discussed with respect to the low-income (i.e., the poor) and other income groupings of commuters resulting in conclusions being drawn and recommendations made.

4 RESULTS AND DISCUSSION

4.1 Effect of changing to IRT on poor/ low-income commuters

This section examines the effect of changing to IRT on poor/low-income commuters. Table 1 illustrates the predicted effect of changing to IRT on poor/low-income commuters.

Table 1: Effect of changing to IRT on poor/low-income commuters

PARAMETER	POOR/LOW-INCOME COMMUTERS					
	Current System		IRT System		Ave. LOS Change	
	Ave. LOS	SD	Ave. LOS	SD	Actual	%
DISTANCE (km)						
Walking distance	1.048	0.8	0.964	0.6	-0.084	-8
In-vehicle distance	15.908	11.1	17.271	10.2	1.363	9
Trip distance	16.956	11.5	18.235	10.4	1.279	8
TIME (min)						
Walking time	31	25.1	29	17.1	-3	-8
Waiting time**	12	8.0	11	2.5	-1	-11
In-vehicle time	38	25.6	33	21.0	-5	-13
Trip time	82	44.6	73	33.5	-9	-11
SPEED (km/hr)						
In-vehicle speed	24.831	1.8	32.755	6.5	7.924	32
Trip speed	12.082	4.0	14.544	5.2	2.462	20
FARE COST (R)						
Fare per trip	7.00	4.1	11.50 ^{db}	0.5	4.50	64
	7.00	4.1	11.00 ^f	2.5	4.00	57
TRANSFERS						
Transfer requirement*	38		93		55	145
No. of Transfer(s)/trip	0.4	0.5	1.2	0.5	0.8	218

Notes: All distances, times and fare costs are calculated totals for one way commuter trips

**Refers to total waiting time including transfer time

*Refers to percentage of commuters requiring one or more transfer(s)

^{db} Refers to distance-based IRT fare per trip

^f Refers to flat IRT fare per trip

Before drawing into details, the reader is reminded that the literature reviewed indicated that the value of public transport in enabling the urban poor to have access to economic (and social) opportunities depends on accessibility, affordability and quality of the public transport services. Thus, for BRT to be successful for the poor they should benefit from improved **accessibility, travel times, affordability, frequency**, reliability, capacity, safety and security (and so on) of public transport services (Fox, 2000; Sohail *et al*, 2005; Wright, 2004). However, in terms of the predicted effect of changing to IRT on poor/low-income commuters indicated in Table 1, the improvement of public transport service level in terms of increased service frequency and accessibility as well as reduced travel times will be

less affordable or unaffordable to the poor commuters due to the predicted tremendous increase in the average total fare cost (i.e., both distance-based and flat IRT fare cost).

All in all, the findings indicate that IRT might not be of value to poor commuters. While poor commuters may benefit from more accessible, frequent and fast IRT services, ironically, these will be more expensive and in some cases unaffordable to them and therefore of no benefit to them. This is in line with the argument by Fox (2000) that where fares are set above the market level the urban poor will be less able to afford them and so the better service will be of no benefit to them. Furthermore, both the predicted higher average distance-based and flat IRT fare costs (than the current average total fare cost) will not benefit but harm the poor commuters, and will constitute a substantial financial burden to them. Fox (2000) ascertains that fares above their market levels will harm the poor as high fares will take a disproportionate share of their households' meagre incomes and, in some circumstances, limit their opportunities to those that can be reached on foot or by bicycle.

The foregoing findings indicate that BRT is not as clearly beneficial to the poor as proclaimed in literature (Fox 2000). Research findings fit well with the assertion by Fox (2000) that BRT may create accessibility benefits for the poor but may be at the expense of higher tariffs. Therefore the poor may not benefit substantially (if not at all) from the improved accessibility and high-quality services which BRT may bring.

The following is a comparative analysis of the effect of changing to IRT on the different income groups. The comparative analysis seeks to illustrate how the poor/low-income commuters' predicted service levels changes compare to those for middle-income and high-income commuters.

4.2 Effect of changing to IRT: by income

Table 2 below illustrates the predicted effect of changing to IRT on the different income groups.

Table 2: Effect of changing to IRT: by income

PARAMETER	LOW-INCOME COMMUTERS (29)						MIDDLE-INCOME COMMUTERS (37)						HIGH-INCOME COMMUTERS (14)					
	Current System		IRT System		Change		Current System		IRT System		Change		Current System		IRT System		Change	
	Ave. LOS	SD	Ave. LOS	SD	Actual	%	Ave. LOS	SD	Ave. LOS	SD	Actual	%	Ave. LOS	SD	Ave. LOS	SD	Actual	%
DISTANCE (km)																		
Walking distance	1.048	0.8	0.964	0.6	-0.084	-8	1.057	0.9	0.946	0.6	-0.111	-10	0.661	0.6	0.747	0.4	0.086	13
In-vehicle distance	15.908	11.1	17.271	10.2	1.363	9	15.136	10.6	16.067	10.3	0.931	6	17.305	12.1	17.920	12.2	0.616	4
Trip distance	16.956	11.5	18.235	10.4	1.279	8	16.193	11.0	17.013	10.4	0.820	5	17.966	12.2	18.668	12.4	0.702	4
TIME (min)																		
Walking time	31	25.1	29	17.1	-3	-8	32	27.7	28	17.1	-3	-10	20	16.9	22	11.5	3	13
Waiting time**	12	8.0	11	2.5	-1	-11	11	6.2	9	2.5	-2	-16	9	4.9	10	2.8	1	5
In-vehicle time	38	25.6	33	21.0	-5	-13	36	24.3	28	18.2	-7	-20	41	27.3	30	18.4	-11	-26
Trip time	82	44.6	73	33.5	-9	-11	78	44.5	66	26.8	-12	-16	70	36.6	62	25.9	-8	-11
SPEED (km/hr)																		
In-vehicle speed	24.831	1.8	32.755	6.5	7.924	32	25.253	1.9	34.462	7.0	9.209	36	25.007	1.7	34.506	6.5	9.498	38
Trip speed	12.082	4.0	14.544	5.2	2.462	20	12.404	3.6	15.031	5.4	2.627	21	14.508	4.0	16.845	5.4	2.337	16
FARE COST (R)																		
Fare per trip	7.00	4.1	11.50 ^{db}	0.5	4.50	64	6.40	3.6	11.10 ^{db}	3.3	4.70	73	7.20	3.2	11.20 ^{db}	3.6	4.00	56
	7.00	4.1	11.00 ^f	2.5	4.00	57	6.40	3.6	10.00 ^f	1.7	3.60	56	7.20	3.2	10.40 ^f	2.4	3.20	44
TRANSFERS																		
Transfer rqmnt *	38		93		55	145	27		78		51	190	7		86		79	1100
No. of Transfer(s)/trip	0.4	0.5	1.2	0.5	0.8	218	0.3	0.5	0.8	0.5	0.6	210	0.1	0.3	1.0	0.6	0.9	1300

Notes: All distances, times and fare costs are calculated totals for one way commuter trips

**Refers to total waiting time including transfer time

*Refers to percentage of commuters requiring one or more transfer(s)

^{db}Refers to distance-based IRT fare per trip

^fRefers to flat IRT fare per trip

Figure 1 below summarizes and provides a diagrammatic presentation of the predicted effect of changing to IRT on the different income groups.

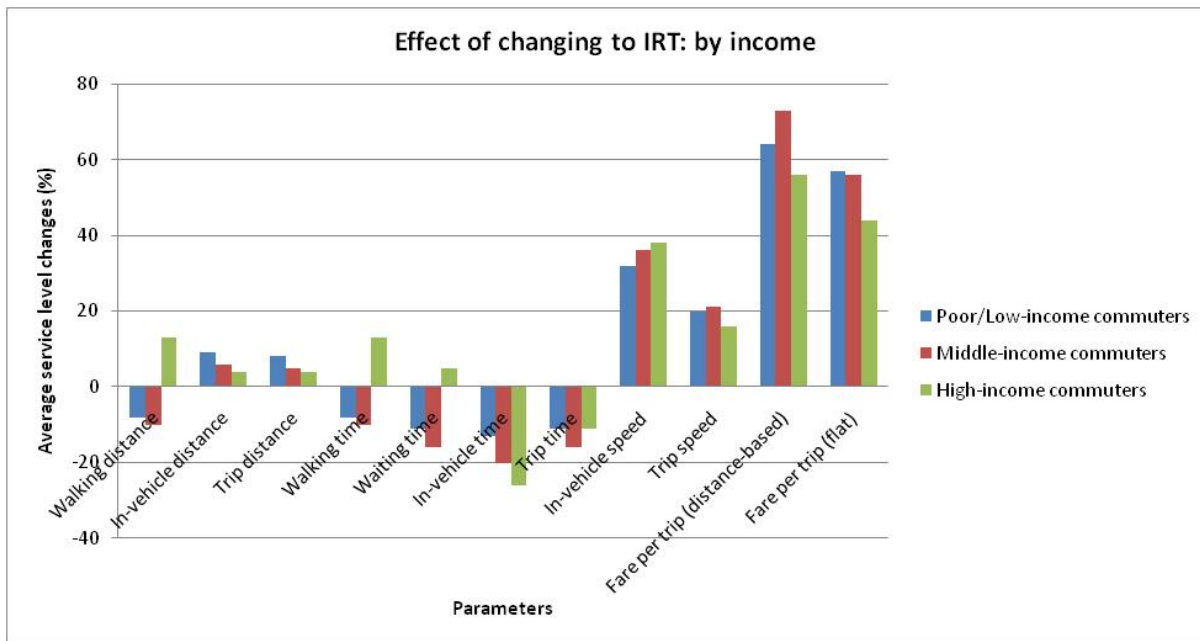


Figure 1: Effect of changing to IRT: by income

As indicated in Table 2 and shown in Figure 1 above, the poor/low-income commuters reveal substantial differences compared to the middle-income and high-income commuters. With the change to IRT, the poor are likely to be relatively worse-off than the other income groups in terms of all the service levels under investigation, i.e., in terms of; improved accessibility and frequency of public transport services; increased average total commuting distance; faster public transport rides and services; reduced average total commuting time; increased average total fare costs (with either the distance-based or flat IRT fare); and transfer requirements.

In light of the foregoing findings, the change to IRT is not likely to contribute much in terms of addressing social equity issues as the urban poor will largely remain marginalized. The paradox is that it is proclaimed in literature that BRT promotes social inclusion instead of isolation (Arrive Alive, undated), can underpin a city's progress towards social equality (Wright, 2004) and should be strongly pro-poor (Fox, 2000). Moreover, particular to Cape Town, literature indicates that the implementation of the BRT-based IRT system is aimed at ensuring that *all* segments of society receive an *equal*, high-quality public transport experience, especially through consideration of the special needs of the transport disadvantaged to include low-income earners (CoCT, 2010).

5 CONCLUSION AND RECOMMENDATIONS

The aim of this paper was to describe the study to assess the role that BRT can play in improving public transport levels of service, particularly for the urban poor users of public transport in Cape Town. To assess the role played by BRT in improving public transport levels of service, the current condition and the effect of changing to IRT were examined. In terms of the predicted effect of changing to IRT on poor/low-income commuters, the study observed that:

- IRT might not be of value to the poor commuters. While the poor commuters may benefit from more accessible, frequent and fast IRT services as well as reduced

travel times, ironically, these will be more expensive and in some cases unaffordable to them and therefore of no benefit to them; and

- Both the predicted higher average distance-based and flat IRT fare costs (than the current average total fare cost) will not benefit but harm the poor commuters.

In light of the foregoing, it was therefore concluded that the BRT-based IRT system is not clearly beneficial to the urban poor in the area of service levels improvements. However, the success of IRT in delivering benefits primarily to the urban poor is contingent upon adopting appropriate measures to rationalize the BRT-based IRT system. The following are recommended, appropriate measures that the South African public authorities can adopt to rationalize the BRT-based IRT system in order for, primarily, the urban poor users of public transport to reap the full potential benefits of BRT;

1) Making IRT affordable to the poor;

Since the urban poor live far from major centres of employment, and higher order commercial and social facilities and would therefore face the highest distance-related IRT fare costs, it is recommended that the experimental flat fare system be maintained instead of changing to the initially proposed distance-based fare system later on. Wright (2004) ascertains that a flat fare system can be a mechanism to ensure greater social equity within public transport services as it generates a cross-subsidy designed to assist lower-income groups (i.e., wherein poor commuters are subsidized by high-income commuters that make shorter trips). Moreover, as findings have indicated that the flat R10 tariff (which is about 50% more the poor commuters' current average total fare cost) is still likely to be unaffordable to the poor, it is further recommended that IRT services be subsidised to make IRT affordable and therefore beneficial to poor commuters. The employment of the mechanisms under investigation by the city such as discounts for regular usage (e.g., weekly and monthly concessions) and reduction in off-peak fares could also help in making fares less costly for all users.

Of particular importance, in this case, is that policies aimed at making public transport affordable do not undermine public transport service levels by causing a reduction in investment. The city should ensure an optimum balance between affordability and quality of service (CoCT, 2010a; CoCT, 2010b).

2) Making IRT route network efficient and effective

Wright (2004) emphasizes the importance of routing efficiency. According to him, it is only a more rationalized routing structure that can mean shorter travel distances and much less in-vehicle travel time. Therefore, in order to ascertain the best means of improving the IRT route network to the benefit of the poor commuters it is recommended that the routing structure be revised and rationalized to make IRT in-vehicle and trip distances and, in turn, in-vehicle travel times further shorter, particularly for the poor commuters who face the longest commuting distances and times. The route rationalisation procedure should also be aimed at maximizing on;

- Route directness to reduce time-consuming transfer requirements; and
- Service coverage and, in turn, on access. The IRT route network should comprehensively cover all residential areas within the city, with feeder routes further penetrating communities, so that all commuters are within, at most, a radius of 1,500km from an IRT stop/station. This, in turn, would reduce the walking distance and the need for commuters (residing in areas where there is no provision of feeder services within an access distance of 1,500km) to take another service (which will not be part of the IRT system) and pay an additional fare in order to reach IRT services.

It is important to note that the flexibility and low-cost of BRT allow it to provide greater network coverage (Diaz et al, 2004; Diaz, 2009) which therefore makes the foregoing proposals feasible.

3) Making BRT solutions work under South African conditions

The BRT-based IRT system of Cape Town draws on successful examples from countries in South America, Asia, North America and Europe, where excellent and affordable BRT systems have been established (CoCT, 2008; CoCT, 2010b). However, contextual differences need to be recognized and taken into account. What may be appropriate in one case may not be workable or acceptable in another. Therefore, as local public transport problems and needs as well as local realities may differ drastically from those in other case cities, BRT solutions need to be tailored so that they can work within the South African environment or under South African conditions (i.e., under existing demographic, economic, environmental, physical (or urban form), social, and political conditions). For example, one of the critical success factors of the Lagos BRT-Lite System (i.e., Africa's first Bus Rapid Transit Scheme) is considered to be the effort to define a form of BRT that meets local user needs, is appropriate to the context in which it is placed, and is affordable and deliverable in the broadest sense (Mobereola, 2009).

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