

# PLANNED AND PARATRANSIT SERVICE INTEGRATION THROUGH TRUNK AND FEEDER ARRANGEMENTS: AN INTERNATIONAL REVIEW

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## ABSTRACT

This paper explores the management of 'hybrid' public transport systems comprised of both 'planned' and 'paratransit' services. Three categories of such hybrid systems can be identified: (1) cities with the least recognition of the role of 'paratransit' services in their public transport system transformation process; (2) cities with the greatest recognition of the role of 'paratransit' services; and (3) cities that modified an initial plan in order to give a more important role to paratransit than originally conceived. The latter category of hybridity is of potential interest to South African cities with respect to how the interface between planned and paratransit services might be managed. Of a set of alternative regulatory approaches that have been applied in cities that fall into this category (including, separate roads, connecting corridors, shared corridors, peak-logging and trunk and feeder approaches), trunk and feeder arrangements are explored further in this paper. Three approaches to planned-paratransit service integration through trunk and feeder arrangements are reviewed: (1) reward schemes; (2) feeder area licencing; and (3) concessioning. The experiences and outcomes of cities that have implemented these approaches are investigated. The paper concludes with a discussion on future research requirements to explore potential relevance to the South African context.

## 1. INTRODUCTION

Public transport systems can play an important role in the development and growth of cities. Several researchers argue that the public transport system of a city partly defines the consolidation of its spatial form and urban structure (Herce Vallejo, 2009; Miralles-Guasch, 2002). The role of public transport systems in developing-world cities, however, often shows a much less clear cut relationship with the structure of the city than in developed-world cities. This is partly because the form and role of public transport systems in developing-world cities is dynamic and continuously redefined by public policy, and the growth of the cities themselves is often rapid and uncoordinated (Avellaneda García, 2007). Cities of the developing world are evolving from monocentric and compact to polycentric and fragmented territories. Usually, low income residential areas are being developed on the urban peripheries, away from the main activity areas (Pucher *et al.*, 2005; Chion, 2002; De Mattos, 2002); while, at the same time, new activity nodes appear in decentralised locations (Avellaneda García, 2007; De Mattos, 2002).

During the last decades some authors have shown that certain road-based public transport service networks are better equipped to adapt to the dynamic urban structures, and its associated demand patterns, of contemporary developing-world cities (Avellaneda García, 2007). Road-based (as opposed to fixed track) systems are required to serve changing trip distributions characterised by longer distances, reduced demand densities and scattered trip origins and destinations (De Mattos, 2002). However, these trip distribution patterns are difficult to serve and have resulted in a general crisis in road-based public transport systems, characterised by: decline in service frequency, loss of demand to the private car, increased operational costs, higher fares, amongst others (Figueroa, 2005). Under these circumstances, planned networks<sup>1</sup> have gradually begun to lose their importance, and paratransit networks<sup>2</sup> have flourished to become major players in the urban public transport system of developing-world cities.

On-the-ground relationships between planned and paratransit services are far from stable; and often the relationship can be reduced to destructive competition for passengers at the roadside (*i.e.* 'in the market'). Within the general public transport system, (where they have survived) planned services usually occupy higher demand corridors and provide a relatively higher quality of service; while paratransit services are frequently (but not always) located on less desirable corridors and/or in areas with physical accessibility constraints (Tangphaisankun *et al.*, 2010; Figueroa, 2005; Cervero, 1991).

The quality of paratransit service offered in most contemporary developing-world cities undoubtedly requires improvement. Problems with paratransit services are well documented (Cervero & Golub, 2007), but their importance and benefits have also been acknowledged: demand responsiveness; territorial coverage; and the integration of both planned and unplanned low-income neighbourhoods into city economic and social systems (Lomme, 2008, Avellaneda García, 2007; Ferreira *et al.*, 2005; Cervero, 2000). Furthermore, more recent studies also suggest that some types of paratransit services are instruments of social encounter and cohesion (Govender, 2011).

One of the objectives of current road-based public transport transformational processes is to deal with deficiencies in the paratransit network. Current processes in many developing-world cities have been aimed at the introduction of new planned networks, frequently leaving paratransit services with a diminished role in the proposed system, and often calling for their eventual withdrawal (Salazar Ferro *et al.*, 2011). This approach to transformation does not work towards the integration of, and complementarity between, planned and paratransit services. It is argued here that the complete substitution of paratransit services with planned services, and the provision of planned services capable of penetrating all neighbourhoods within fast growing South African cities, are likely to be difficult to achieve (Salazar Ferro *et al.*, 2011). Consequently 'hybrid' public transport systems comprised of both planned and paratransit services are likely to be an enduring feature of many devel-

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<sup>1</sup> The term 'planned networks' refers to public transport services that have been planned by a government or officially sanctioned private sector agency to operate according to a scheduled timetable or headways, and are also sometimes referred to as 'formal' services. This use of terminology is not intended to imply that 'paratransit' services are unplanned in nature, as they often involve careful planning of vehicle allocations to routes and hours of service.

<sup>2</sup> The term 'paratransit networks' refers to a flexible mode of passenger public transportation that does not follow fixed routes and/or schedules, typically in the form of small- to medium-sized buses. In the developed world paratransit services are often associated with demand-responsive 'dial-a-ride' systems provided for persons with disabilities. In the developing world paratransit services are usually provided at a far larger scale for the general population, often by unregulated or illegal operators within the informal sector. For this reason paratransit in the developing world is also sometimes referred to as 'informal transport'.

oping-world city public transport systems. Achieving integration and complementarity across planned and paratransit services are therefore worthwhile policy objectives.

In order to explore the prospects of such integration and complementarity, this paper studies selected international experiences that have introduced or experimented with novel forms of planned – paratransit interface. In the following section different approaches to integrating planned and paratransit services are described and examples are given. Section 3 then investigates, in greater detail, one of these approaches: the trunk-planned and feeder-paratransit arrangement. Three types of trunk-feeder schemes are identified and case studies are presented for each, including initial information on processes and outcomes. Section 4 concludes with a discussion on further research required to explore the potential relevance of these experience for South African cities.

## 2. APPROACHES TO PLANNED – PARATRANSIT SERVICE INTEGRATION

After the relative success of South American cases in Bogota, Quito and Curitiba, bus rapid transit (BRT) was exported to the world as a model for improving public transport systems. In many developing-world cities, BRT implementation was viewed as a way of transforming the incumbent paratransit industry. Initially, projects proposed in the developing-world modelled corridors and organisational schemes along the lines of the South American cases, with Bogota being the more publicised exemplar (Lleras & Pereira, 2009). It was expected that the introduction of the new planned network will ultimately lead to the formalisation or withdrawal of the paratransit sector. However, recent analyses have suggested that, in some contexts at least, relying only on BRT to formalise an entire paratransit industry is unrealistic (Wilkinson *et al.*, 2012; Venter, 2011). Moreover, recent experiences in BRT implementation, and public transport transformation processes more generally, have shown that the South American experiences do not represent a panacea and require significant adaption to local conditions. By acknowledging the local context (in terms of operating environment and regulatory policies), many projects have been amended, and, in some cases, it is possible to find a newly defined role for paratransit services.

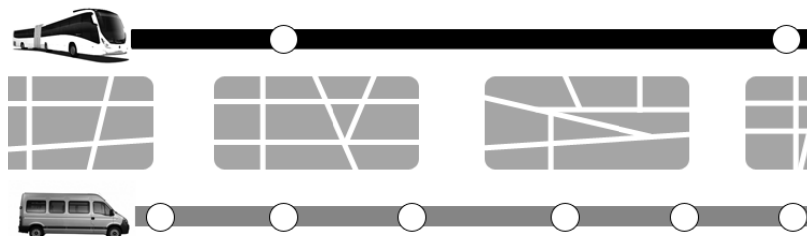
This section presents different approaches to planned – paratransit service integration. While the array of approaches is intended to be inclusive –the degree of success achieved was not a criterion for approach identification and selection– it cannot be claimed that the review of practice undertaken to date has been exhaustive, so further review could expose additional approaches.

### 2.1. Separate or parallel roads

This alternative emerges in corridors where the capacity of the planned network services provided is exceeded by passenger demand and opportunities therefore open up for paratransit services to satisfy unserved demand on parallel roads. Planned services operate along a defined road providing faster services and linking distant areas of the city. Paratransit services focus on serving the local demand (and thus use smaller vehicles) ideally along a parallel road, normally separated from the planned road by an urban block. The transport demand can be distributed according to vehicle capacities and by trip length.

The separate roads alternative remains mainly hypothetical: documented examples of implementation are not easily found. Porto Alegre (Brazil) considered the implementation of such a scheme but finally decided against it. Curitiba (Brazil) uses a similar type of arrangement along the *trinary road system* of its *structural axes*: however, in this case both

roads are served by planned operations and bus sizes are similar. Buses operating in the central road provide relatively slower services with stops approximately every 500 metres; and buses operating in parallel roads, referred to as direct services or express services, have fewer stops (one every 3 kilometres) and higher operating speeds (Ardila Gómez, 2004).

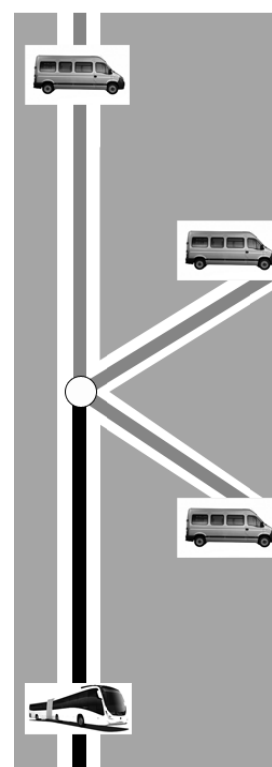


**Figure 1: Separate or parallel roads.** Source: Authors.

## 2.2. Connecting corridors

In this alternative, planned services operate one or more corridors within the urban territory. Such corridors are then linked to other corridors where paratransit services operate. Ideally, this scheme includes regulatory frameworks that recognise the role of paratransit services and allow for the interface between planned and paratransit services to be a complementary one. It is different from a trunk and feeder scheme because planned and paratransit corridors have similar demands and because corridors can function independently and connect different nodes within the city. Under this scheme, planned and paratransit corridors connect via a transfer station. Corridors are operated separately and they do not undermine each other's services.

Similar to the separate or parallel roads alternative, in the absence of well-documented cases the connecting corridors alternative remains hypothetical. This type of scheme usually occurs in cities without being planned or regulated through a framework; many cities that have recently implemented BRT corridors experience this type of arrangement. However, in this research, examples of cities that planned for one such scheme have not been found.

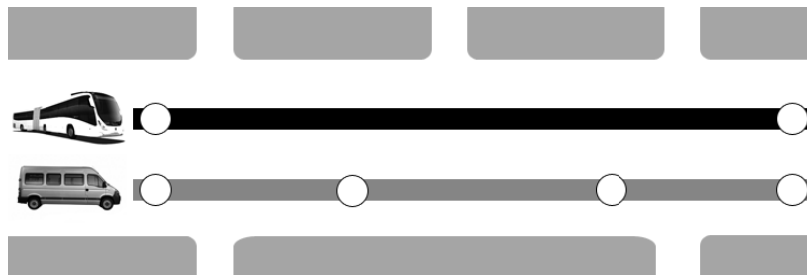


**Figure 2: Connecting corridors**  
Source: Authors.

## 2.3. Shared roads or busways (interlining)

Under this scheme, planned and paratransit services share a road or even an exclusive busway. In the former possibility, paratransit services operate along mixed traffic road space without directly competing with planned services for kerbside passengers; these planned services operate along a segregated busway. In the latter possibility, both paratransit and planned services operate within a segregated busway.

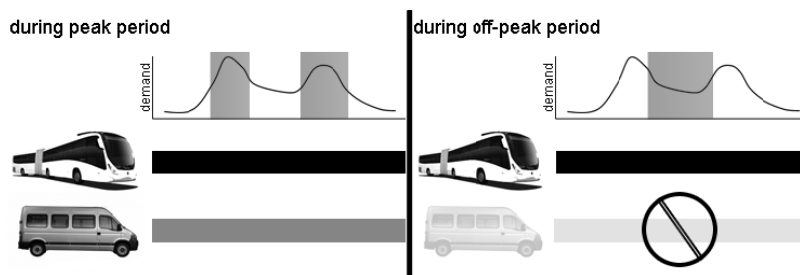
An example of this latter arrangement can be found in Delhi's (India) recently built BRT corridor. Along this corridor initial opposition from other road users to an exclusive BRT lane led to system modifications during implementation. One of those modifications was to allow paratransit vehicles to operate in the previously exclusive BRT lane. A key reason for this modification to the initial concept was to appease the automobile and highway lobby which argued (supported by reports in the local press) that there would be an increase in the corridor's overall congestion if paratransit buses were forced to operate in mixed traffic lanes (Hidalgo & Pai, 2010; Pucher *et al.*, 2005). Delhi's BRT corridor has been characterised as a burden on the city, mainly because it resulted in deteriorating traffic conditions (Ponnaluri, 2011), and the implementation of future phases in the BRT deployment are being contested.



**Figure 3: Shared roads or shared busways.** Source: Authors.

#### 2.4. Peak-lopping

The third type of arrangement for planned network – paratransit network interface addresses differences in passenger demand during peak and off-peak periods. Under this type of scheme, during peak demand periods, paratransit vehicles are allowed to operate along planned services' routes, thus increasing the number of vehicles utilised and route capacity. As bus operator vehicle fleet requirements are determined by peak demands, this arrangement has the benefit of reducing vehicle fleet size and costs. Once the peak period is over, paratransit vehicles return to their normal operating routes, away from planned service network routes.



**Figure 4: Peak-lopping.** Source: Authors.

The University of Cape Town's student and staff bus service –called the Jammie Shuttle– uses this type of arrangement. When introduced, minibus-taxi operators perceived the Jammie Shuttle as a threat to their operations, mainly because it would take passengers from their existing services (Duff-Riddell *et al.*, 2006). This opposition was resolved by implementing a peak-lopping scheme along the lines described above. Currently, paratransit vehicles are contracted to operate during peak hours under strict conditions, along specified Jammie Shuttle routes. While operating services in peak hours, the paratransit vehicles are only permitted to transport university staff and students: picking up other passengers and charging fares is proscribed.

## 2.5. Trunk and feeder

The trunk-planned and feeder-paratransit arrangement is the fifth type of scheme. Under this alternative, demand can effectively be split into two distinct types of routes and services. The trunk-planned routes serve longer distance connections using higher capacity vehicles and, depending on stop spacing and the effectiveness of prioritisation measures along links and at intersections, higher operating speeds. The feeder-paratransit routes use smaller capacity vehicles (although not exclusively) to operate along shorter local routes. The nature of the arrangement creates interchange stations where transfers are made.

This type of arrangement can be observed in a variety of developing-world cities. Recent and current transformational processes that include the implementation of a BRT-type system along a high-demand corridor often apply this type of scheme. Cities that have used this approach include Quito (Ecuador) and Sao Paulo and Recife (Brazil); while, most notably, Cape Town is currently engaged in analysis to explore the feasibility of a variant of this scheme (Fortune, personal communication 25 November 2011). Furthermore, in other cities where BRT-like systems have been implemented without the introduction of planned feeder services, paratransit operators have adapted their routes to provide feeder-paratransit services to and from planned trunk service stops. Given that 68% of BRT passengers have been found to transfer with paratransit or informal for-hire services (*i.e.* motorcycle taxis and minibuses), this appears to have been the case in Lagos (Nigeria) (Dairo & Brader, 2009). Lastly, researchers in developing-world cities have presented analyses of some of the advantages of this arrangement: this is the case of Bangkok (Thailand) where a study showed the willingness of passengers to use such feeder arrangements (Tangphaisankun, 2010). Examples of the trunk and feeder scheme will be further explored in the next section.

## 3. THE TRUNK AND FEEDER INTEGRATION ARRANGEMENT

Justification of the selection of trunk and feeder arrangements for further investigation is based on a provisional assessment of the success possibilities of the alternative approaches presented in the previous section: the separate or parallel roads alternative presents the risk of destructive competition when line capacities change. The connecting corridors alternative is most likely to be regarded by implementing agencies as a temporary arrangement. The shared roads or busways alternative either compromises the operations of planned service vehicles on busways or presents the risk of destructive interloping, and has been widely criticised in cities where it has been implemented (e.g. Delhi and Jaipur). The peak-logging option presents limitations when extended beyond a single corridor: questions remain on what the role of paratransit services would be during off-peak periods when applied across an entire network.

An initial literature review revealed three approaches to the trunk-planned and feeder-paratransit arrangement: reward schemes, area licensing schemes and concessionaire schemes. These are described and possible alternatives for future in-depth case study are briefly discussed. It is not claimed that the list of schemes described is comprehensive. Further research might reveal additional approaches.

The trunk-planned and feeder-paratransit arrangement can use urban structure to its advantage. Commonly, feeder services are projected to operate in mainly residential areas (often zones with accessibility constraints and/or recently developed neighbourhoods).

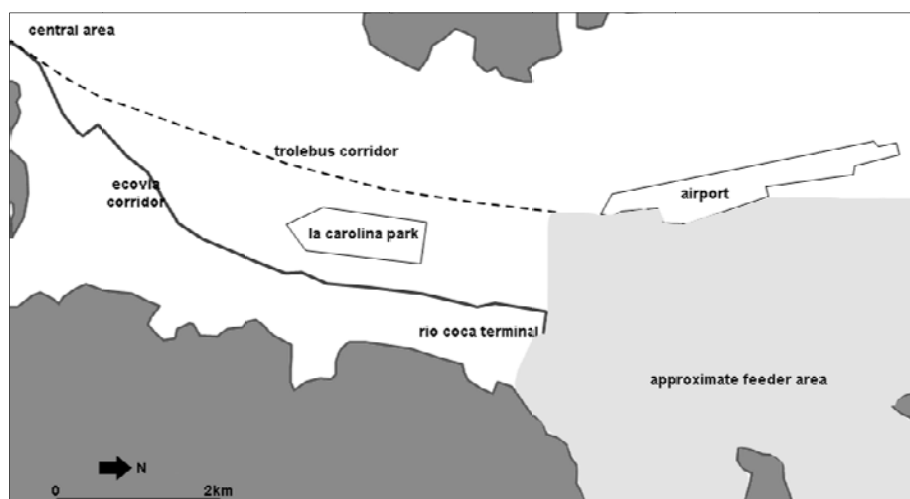
Generally, these residential areas correspond to the low-income zones of the city where the concentration of public transport riders is highest. However, in cases such as Hong-Kong, paratransit can also operate in areas of high job concentration in the city (Lee, 1989, 1990). It is argued that local context needs to be acknowledged and it is also contended that trunk-planned corridors do not necessarily need to be implemented over the entire urban territory. It is not suggested that every city's main corridor should be operated under a trunk and feeder scheme; but that in corridors where conditions are favourable, the implementation of such schemes can lead to a healthier planned – paratransit interface.

### 3.1. Reward schemes

In this scheme, paratransit vehicles serve as feeder services without having a structured contract with the planned service network. Paratransit vehicles collect passengers along a route – normally not regulated by authorities – and drop them off at a planned network station, where passengers then transfer to the planned network services. Paratransit vehicles are paid or rewarded according to their performance; for instance, they receive a reward for every passenger brought to the station. Such schemes clearly require tight control and monitoring of paratransit vehicles entering the planned network station.

#### 3.1.1. *Case 1: Quito, Ecuador*

Quito has implemented this type of reward scheme. After the relatively successful implementation of the Trolebús service in 1995 (Hidalgo & Grafiteaux, 2006), the city planned a second corridor –called Ecovía– to complement its initial network<sup>3</sup> and to continue the transformational process initiated earlier. However, contrary to Trolebús planning and implementation, it was decided that operations would be given to existing private paratransit bus companies operating in that corridor. This process was difficult and progressed very slowly, leading to important modifications to the initial plan (Hidalgo & Grafiteaux, 2006). Ultimately, to start operations in 2001, trunk-planned routes were implemented and operated on a temporary basis by UOST<sup>4</sup>, a municipal agency. As observed by the authors, feeder-paratransit routes were operated by existing operators using the rewards mechanism. Paratransit operators were paid for every passenger brought to the Ecovía station.



**Figure 5: Quito's Ecovia corridor.** Source: Authors using World Bank, 2004.

<sup>3</sup> In 2004, Quito implemented a third project called the North-Central corridor.

<sup>4</sup> In 2003, operations were handed over to Transoc, a company formed by existing paratransit operators. However, because Transoc did not comply with the contract terms, operations were returned to Unidad Operadora del Sistema Trolebús (UOST) in 2005 (Hidalgo & Grafiteaux, 2006).

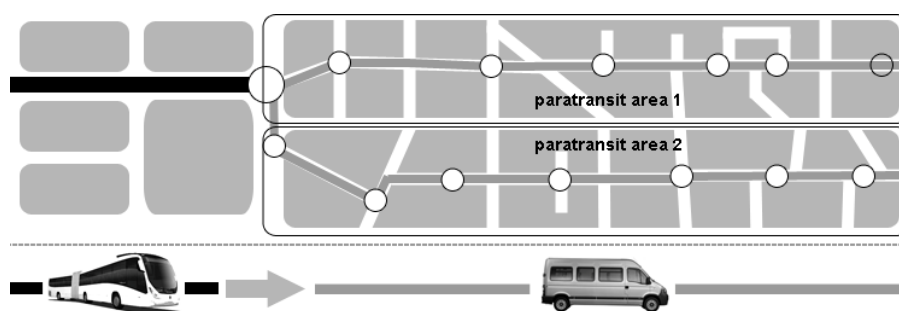
Spatially, Ecovía has a single trunk corridor parallel to the Trolebús corridor (**Figure 5**). This trunk corridor connects the historical centre of Quito with residential areas to the north; passing near the area of the La Carolina Park where a new activity area has developed. Feeder services operate only to the northern station of the network (Río Coca) and not in the central area of the city. Feeder routes operate inside the northern established urban territory and on the peripheries of Quito (where new urban areas are being developed). The peripheries of the city are located on mountainous terrain where access can be difficult. From the Río Coca terminal, feeder routes link the north-east part of Quito, a largely low-income residential area, with the trunk corridor. Feeder services also connect some middle and upper class neighbourhoods with the terminal. Feeder routes also link the Ecovía network with the Trolebús La Ye terminal, next to the airport.

### 3.1.2. Case 2: Jakarta, Indonesia

The City of Jakarta had a recent unsuccessful experience with the introduction of a rewards scheme. After the implementation of a new trunk BRT corridor in the city – Transjakarta– a lack of regulatory reforms created a problematic system (Hook, 2004). The implementation of Transjakarta was reduced to the introduction of a closed segregated BRT corridor without introducing regulatory modifications to the existing system. Newly introduced BRT vehicles operated in segregated lanes, while incumbent bus companies continued to operate in mixed traffic, creating significant congestion problems along the corridor because of the high number of vehicles operating in it (Hook, 2004). Authorities, then, attempted a modification to the system by introducing feeder services to be operated by the existing bus companies in order to reduce the number of vehicles in the corridor.

The City of Jakarta negotiated a fare system with paratransit operators in which the paratransit operators would offer discounted fares to passengers they carry to a Transjakarta stop for the purposes on transferring onto the BRT service (Hook, 2004). Transjakarta would then in turn reimburse the difference between the base and discounted fare, and provide an additional bonus payment to the paratransit operator as an incentive. Thus BRT passengers were encouraged to use paratransit feeders, and paratransit operators were encouraged to service feeder routes. The scheme encountered obstacles when implemented, largely in the form of a breakdown in trust: paratransit drivers in charge of receiving discounted fares and operating under conventional daily income target conditions did not trust that paratransit owners would uphold the agreement and pass on discount reimbursements and bonuses.

## 3.2. Area licensing schemes



**Figure 6: Area licensing scheme.** Source: Authors.

A second scheme –area licensing– involves a more defined and structured type of arrangement. With the trunk corridor or route being served by planned services, paratransit-feeder operators are licensed to serve adjacent demarcated urban zones (commonly, but



not necessarily, neighbourhoods) into which the planned service network does not penetrate. Feeder-paratransit vehicles thus collect passengers inside the pre-defined area and transport them to a station of the planned network. As a result, the area coverage of the overall service is enlarged.

### 3.2.1. Case 3: Recife, Brazil

In Recife one such scheme was introduced in 2003. The Complementary Transportation Service of Passengers law of 2003 focused on integration between the existing planned bus network and vehicles of the paratransit sector in the 12- to 20-seat range.

As in many developing-world cities, during the 1990's, small paratransit vehicles dominated the public transport system of the city. Paratransit services appeared to be faster and more flexible than existing planned services; they mainly flourished in areas with accessibility problems that the planned network was unable to serve (Ferreira *et al.*, 2005). By 2000, the public transport system of Recife was composed of 16 private 'formal' bus companies, one subway network and an atomised paratransit sector that carried 19% of the city's travel demand (Ferreira *et al.*, 2005). Furthermore, 83% of the paratransit routes were duplicates of planned bus routes (Ferreira *et al.*, 2005). The combination of an increasing number of private cars and the inefficiency of public transport routes created significant congestion problems in the city: the general transport network is radiocentric with the historically more attractive node being the centre of Recife and, thus, congestion was most problematic in this area.

The main objective behind the 2003 initiative was to complement the bus services with the relatively faster and more flexible existing paratransit services (Ferreira *et al.*, 2005). Initially two options were considered: (1) to include paratransit routes as supports to existing planned routes (consistent with the separate or parallel roads model described in section 2); or (2) to plan new routes inside neighbourhoods where paratransit vehicles would operate. The latter was chosen. After a reorganisation of existing paratransit routes to serve low-income neighbourhoods, existing planned bus network stops were transformed into transfer stations where paratransit vehicles could off-load passengers into the planned network. Some of the results of the initiative were an increase of 31.4% in planned bus network demand and a general reduction of trip times (Ferreira *et al.*, 2005).

### 3.2.2. Case 4: Santiago, Chile

Santiago's experience with area licensing schemes relates to sedan taxis<sup>5</sup>. The size of the paratransit vehicles operating in this city makes the case unique. Starting in 1992, authorities had defined and acknowledged three types of taxis:

- Metered taxi: *taxi común*.
- Sedan taxi: *taxi colectivo*. For this type of taxi, routes are predefined; they operate in a manner similar to paratransit-minibuses in South African cities.
- Tourism taxi: *taxi de turismo*. This type is defined as a specialised metered taxi operating between the airport, main hotels and main tourist attractions.

Only sedan taxis were involved in the trunk and feeder scheme.

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<sup>5</sup> Another area licensing scheme was also implemented during the introduction of the Transantiago project. In it, existing bus operators were, in some cases, transformed into feeder services to the existing metro/subway system (Muñoz & De Grange, 2010). A review of this experience is a part of future phases of this research.

In Santiago, sedan taxis appeared as a response to elevated bus fares and increasing congestion during the 1980's. They proved to be increasingly competitive, mainly because of their reduced size which was able to produce higher operating speeds (Figueroa, 2007). During the 1990's, the city implemented strong regulations for buses that included the eradication of existing minibuses (Figueroa & Orellana, 2008), but sedan taxis remained unregulated. The number of sedan taxis then gradually grew from 7 000 in 1990 to 13 000 in 2000 (Figueroa, 2005). Sedan taxi operators progressively specialised in connecting residential areas with the metro/subway network, and in operations inside the more peripheral areas of the city (Figueroa, 2007). However, a lack of regulation led to an over-supply of vehicles and, in 1998, a cap on the number of sedan taxis was established by authorities. Included in this proposal was a project to include sedan taxis in the ensuing modification of the transport system (in the form of the Transantiago system<sup>6</sup>).

Eventually, in 2000, a tendering process for 355 services (*i.e.* routes) of sedan taxis was initiated. Routes were divided into 10 areas, and allocated services that were to later function as feeder vehicles in the Transantiago bus system (Figueroa, 2007). Furthermore, it was expected that this initiative would result in a modernisation of the paratransit-sedan taxi sector and firmer control on the number of vehicles operating in this sector (it was estimated that 11 319 vehicles would be included as feeders) (Figueroa, 2007). Nevertheless, fares for sedan taxis remained unregulated.

### 3.3. Concessionaire schemes

A third scheme –concessioning– enables planned network operators to avoid investing in feeder route services by concessioning them to paratransit operators. Paratransit operators, in turn, become stakeholders in the planned – paratransit integrated network. Under this scheme, feeder routes can be established by the planned network operator, or they can be defined by paratransit operators during the concessioning process. As with the area licensing option, the scheme requires a structured agreement between planned and paratransit operators. However, it does not necessarily entail the transformation of existing paratransit companies into planned network operating companies.

The cases selected to illustrate this scheme are focused at identifying different types of concessionaire arrangements involving paratransit operators or small bus companies. In that sense, experiences may not necessarily correspond directly to a trunk and feeder system, but have the potential to do so.

#### 3.3.1. *Case 5: Porto Alegre, Brazil*

A concession scheme was used for a long period of time in Porto Alegre, even before the planning of a BRT network. Starting in the 1980's, Brazil's paratransit sector has been regulated and formalised (Lindau *et al.*, 2008) and, thus, private companies operating public transport services have a history of being included in transformational processes. Consistent with this history, Porto Alegre's current transport network is characterised by a busway network, first implemented during the 1970's and operated by private companies. The network follows a radial pattern from the historic centre of the city. The bulk of the public transport demand is served by a conventional bus network operated by 15 private operators organised into four consortia. There are approximately 1 600 vehicles operating a total of 320 different routes. The general transport system is completed by one metro/subway line of 34 kilometres and a city-regulated private minibus company operating roughly 400 vehicles (Corporación Andina de Fomento, 2010). The 320 bus routes op-

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<sup>6</sup> The Transantiago project was implemented in February 2007.

erate using a concessioning scheme. The city relies on what is referred to as a 'sponsored concession': the private companies provide services directly to the users; in turn users pay a predetermined fare; and authorities must, in addition to the collected fares, remunerate the private company (Lindau *et al.*, 2008).

Modifications to the historic network have been implemented slowly. Recent studies suggest that the urban structure has changed drastically (the highest number of jobs are no longer in the CBD) and that the radial pattern is not fitted anymore to the current urban structure (Lindau *et al.*, 2008). Therefore, projects that aim at transforming this public transport system have been put forward; one of those projects is the introduction of a BRT system.

### 3.3.2. Case 6: Hong Kong, China

A relatively successful experience of bus franchising, first introduced in the 1970's, was conducted in Hong Kong. Between 1933 and 1975, two private bus operators (Kowloon Motor Bus and China Motor Bus) had a monopoly over certain areas of the city (one on each side of the Victoria Harbour). After the construction of a cross-harbour tunnel in 1974, authorities decided to negotiate with the existing companies in order to develop cross-harbour bus routes (Meakin, 2004). In 1975, a 'profit control scheme' was introduced. Under this scheme, bus companies earned a maximum percentage return according to their average net fixed assets. The authorities' main objective was to provide incentives for capital investments to be made by the bus companies to increase the value of their fixed assets and therefore their revenue (Meakin, 2004). While Kowloon Motor Bus invested adequately to expand and renew its fleet, China Motor Bus decided to provide a minimum number of buses. The profit control scheme was initially criticised because it triggered significant fare increases.

In 1991, the government of Hong Kong decided to modify the franchising arrangement and to abolish the profit control scheme; from this date, bus franchises would be awarded through tenders (Meakin, 2004). New bus operators were invited to bid for the market. New companies CityBus and Long Win won bids to serve newly developed areas (Meakin, 2004). In 1998, China Motor Bus' franchise was not renewed due to underperformance. Currently, franchised operations are required to disclose financial and operating information and, every five years, need to submit to authorities a planning programme that includes route development (Meakin, 2004). In 2002, franchised bus companies accounted for approximately 32% of daily public transport trips (Meakin, 2004).

## 4. DISCUSSION AND CONCLUSION

The aim of this paper was to explore the prospects of achieving integration and complementarity across planned and paratransit service networks, by identifying types and examples of planned and paratransit service interface. The presentation of cases has, of necessity, been cursory, and further in-depth study will be required to better understand the nature of the schemes and their outcomes. In this process, particular attention will be given to the following aspects: (1) the organisation of, and engagement with, the incumbent paratransit sector; (2) the prevailing regulatory frameworks and the limitations they impose; and (3) the urban context in which schemes were developed.

- With regard to the incumbent paratransit sector, transformational processes in different cities must consider a point of entry for engagement appropriate to their unique business organisation. There are two possible levels of entry: the (route or zone) associations; or the owners (or operators). Further case study research will explore how this engagement occurred.
- With regard to prevailing regulatory frameworks, local conditions and institutional constraints can help explain the choice of one or another scheme. The implementation of any scheme or arrangement must be accompanied by coherent regulatory frameworks (see Gwilliam, 2003 for a discussion on the pitfalls of inadequate regulatory frameworks), and by clearly defined roles and projected benefits for planned and paratransit service operators. Further case study research will explore these regulatory frameworks, and how they limited implementation.
- With regard to urban context, further case study research will be aimed mainly at studying: (1) what type of urban areas form feeder zones (strictly residential, mixed land use, main activity inner zones, etc.); (2) if significant changes to the urban structure and form have followed the implementation of feeder services; and (3) the typology of feeder routes (loop, single corridor, etc.) serving these zones. Initial evidence suggests that feeder-paratransit networks are usually implemented in residential areas and in middle to low-income neighbourhoods. Few cases exhibit feeder services inside employment or industrial areas.

Exploration of these three aspects will help produce a picture of case city public transport systems at different moments in the transformational process. The three proposed moments are: (1) before the implementation of the trunk and feeder arrangement; (2) during the implementation or the current state of the process; and (3) the actual or expected outcomes. Information collected from this analysis will facilitate understanding and learning from international experiences.

It has been argued in this paper that the public transport systems of developing-world cities should be considered as a whole, where paratransit and planned networks coexist in a dynamic way. The initial analysis of international experience suggests that the trunk and feeder arrangement (or any other arrangement for that matter) on its own will not generate a comprehensive transformation of the paratransit industry, and that different cities have histories of paratransit regulation that create path dependencies. Recognising the importance and role of paratransit service networks can, if adequately managed, be beneficial to the overall public transport system. However, the selection of one or another planned and paratransit service interface must consider the context in which the solution is expected to be implemented. Each of the cases presented in the paper has various singularities that make identical reproduction of a scheme or arrangement inappropriate in a different context.

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