Rea Vaya: South Africa's first bus rapid transit system

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Today, both the public and private transport sectors are facing challenges as a result of an increase in vehicle ownership and the suburbanisation of both firms and residences in the world. In the past, public transport was focused mainly on central areas of cities where high population and employment densities enabled frequent services, high occupancy rates and many routes. As growth is spreading to suburban areas from the metropolitan area, imperative challenges arise for public transport: to increase service in order to better serve commuters and to integrate suburban service with metropolitan service.[1] Public transport must be made more attractive and user friendly in relation to improved service, travel information, reliability, safety and the upgrade of infrastructure such as waiting stations. Cost is an important factor that influences the demand for public transport in relation to the time spent waiting, boarding and alighting from vehicles coupled with the risks and inconveniences involved in those actions. It has also been suggested that commuters and business users board the fastest and most direct routes.[2] Here we comment on the performance and maintenance of the Rea Vaya system – South Africa's first bus rapid transit system – since its inception.

Historical development of bus rapid transit

The large-scale development of bus rapid transit (BRT) systems started in Curitiba (Brazil) in 1974, before which there were several smaller-scale projects. After the success of an effective BRT in Curitiba, other cities were inspired to develop similar systems.[3] In the 1970s, development of BRT systems was limited to the North and South American continents. In the late 1990s, the replication of the BRT concept gained momentum and BRT systems were opened in Quito, Ecuador (1996), Los Angeles, USA (1999) and Bogotá, Columbia (2000).[4] The TransMilenio project in Bogotá started operation in 2000 and its success as a state-of-the-art BRT system drew attention from around the world. As of 2005, there were 70 such systems around the world, based on one definition of BRT.[5,6]

National operating subsidies

Developing a business plan for a public transport system is difficult for any transport authority unless they know the rate of the operating subsidy that will be made available to them. At each metro or functional area, the existing level of subsidy should continue at the level currently allocated for bus subsidies. A judgement call must be made by the transport authority on which proportion of the subsidy will be allocated to catalytic initiative. In other words, the authority must plan for zero operating subsidy for the catalytic initiative as they have no control over the subsidy streams, which are in place because they applied to standard buses and rail.[7]

Bus rapid transit systems in South Africa

Commuters in the Gauteng Province have been using the BRT system called 'Rea Vaya', which means 'we are going'. It is the first of its kind in South Africa. Phase 1 of the BRT system, which linked Soweto to the centre of Johannesburg, came into effect on 30 August 2009. There are also functioning BRT systems in Cape Town, Port Elizabeth and Pretoria, and on-going implementation of such a system in Durban.[8]

Johannesburg's bus rapid transit operation

Rea Vaya has a capacity of up to 90 passengers on designated median lane trunk routes and currently conveys 16 000 passengers per day. Complementary buses collect passengers at Rea Vaya stations on the trunk routes and operate on the kerbside of the lane.[9]

The South African cabinet appropriated public transport in an integrated way in March 2007.[10] With funding at hand to address the issues of infrastructure and vehicles, they embarked on a solution for the severe traffic congestion and persistent mobility problems of the nearly 1.5 million transport users in the city. The first corridor spans through a 25-km trunk line with median lanes, 27 trunk stations and feeder routes that link the CBD and Soweto, which is one of the busiest commuter corridors in the city.[11] (For the route map see http://www.reavaya.org.za/images/stories/2009pdfs/startermap-27aug09.pdf)

On-site assessment

We assessed the performance of the system and its possible pros and cons on-site using a checklist (Table 1). The Rea Vaya BRT system makes use of a median bidirectional BRT lane configuration which is located in the middle of the roadway, as an exclusive right-of-way with pavement and lane markings, intersection road markings and stud separators (10 cm). The stud separators serve to separate the other traffic to avoid vehicle manoeuvre. It has distinctive branding in the form of markings on the vehicle that differentiate it from other public transport systems. The standard bus is fitted with low-emission technology, bi-fold doors at both sides and multiple entrances for boarding and alighting.

Table 1: Checklist for the assessment of the Rea Vaya bus rapid transit system

	Present
Lane configuration	
Basic separator cones	
Pavement marking	√
10-cm separator blocks/studs	√
50-cm separator blocks/studs	
Kerbside lane configuration	
Segregated lane configuration	
Median lane configuration	√
Bus colouration/ road markings	
Intersection roadmarking	√
Lane marking	√
Bus way with fully coloured way	
Distinctive BRT identity and image	√
Distinctive marketing identity for the system	√
Landscaping	
Cycle paths/footpaths	√
Tree planting and grassing	√ (but minimal)
Additional park or civic improvement	
Integration with other modes at stations/terminals	
Bicycle parking at stations/terminals	
Formal taxi stands at stations/terminals	
Car parking at stations/terminals	
Intelligent Transportation System	
Real-time information display	√
Connection to the control room	√
Audio announcements on BRT buses	
Incorporation of schedule data into station electronic information systems	√
Updates of schedules and maps at stops	√
Adaptations of existing transit signal infrastructure	√
Maps and information	
Maps at station	√
Information kiosk	√
Station amenities	
Air conditioning	
Elevator for disabled	√
Automatic doors	√
CCTV/security	√
Enhanced station environment	√
Wheelchair accessible station	√
Full weather protection on all station platforms	√
Telephones	√
Security	√
Consistent pattern of station location, configuration and design	√
Separate BRT, local bus, automobile and pedestrian movements in station design	
Fare collection system	
Smart card	√
On-board fare collection	
Pre-board fare collection and fare verification	√
Flat fare type	√
Zonal fare type	
Distance-based type	
Other	
Convenient pedestrian and bicycle access to transit facilities	
Bus stops are accessible to persons with disabilities	√
Wheelchair ramp access to the street at crosswalks or mid-blocks	√
Stops accessible by sidewalk or pedestrian paths	√
Bus stop shelters and/or benches	√
Sufficient lighting	√
Bus type	
Low-emission vehicle technology	√
One side doorway	
Both sides doorway	√
Standard bus type	√
Articulated bus type	
Bi-articulated bus type	
Double-decker bus type	
Boarding/alighting	
Multiple-door boarding/alighting	√
Single-door boarding/alighting	
Door with ramp	√
Door type	
Swing door	
Bi-fold door	√
Plug	
Pivot door	
Sliding door	
Other	
Safety	
Cleanliness	
Accessibility	
Reliability	
Lack of intermodal coordination	
Urban traffic congestion	
Inability to meet service demand	
Pedestrian crossing controlled by traffic light	
Excessive bus-to-platform gaps at stations	

As the lane is located in the middle of the roadway, the stations are also constructed at the median of the roadway. Each station has maps, automatic doors on both sides of the station, an elevator for wheelchair accessibility, an enhanced environment, full weather protection on all platforms, telephones, security, CCTV and an information desk. The stations have a uniform configuration and design. In some places, the median of the road is decorated by planting of trees or grass and a footpath. The stations have branded temporary streamlined shelters with comfortable seats for the passengers to wait for the next available bus, CCTV, maps, security and real-time information displays. Real-time information displays and CCTV are installed at the stations as part of the Intelligent Transportation System (ITS) to improve passengers' convenience, speed, security and safety, and system reliability. The system makes use of CCTV for monitoring the operations of the buses using Automatic Vehicle Location, which is connected to the control room, and enables the update of schedules, both inside the bus and at the stations. Both smart card and off-board payments are accepted, but off-board payments, which are a flat rate, are more common. Pre-board fare collection and verification are exercised for those that are not using a smart card. The pedestrian crossings are controlled by traffic lights in most places. Existing transit signal infrastructure has been adopted where deemed suitable. The system is reportedly safe, clean, accessible, well coordinated between modes and able to meet service demand.

Problems and challenges

The ability to attract more customers, especially private car users, is important. The development of a robust business and financial model for continual maintenance of the existing system is a challenge. Continuous training for the owners and operators in the skills required to maintain the success of the system is necessary.

Conclusion

The median configuration of the Rea Vaya BRT system, which operates on a dedicated bus lane, offers improvement in travel time, reliability, safety and speed compared with other public transport systems and automobiles travelling in mixed-flow traffic lanes. A separate lane enables the system to have lower headways and accommodate higher peak period loads. When further combined with signal priority, delay is greatly minimised at intersections.

The BRT system is commuter friendly and cost effective over a long distance, compared with other public transport systems because it operates at a flat rate. Pedestrian safety, convenience and secure access to the facility for both the physically challenged and able commuters are provided. The installed ITS ensures passengers know the exact time and place to disembark, which is especially useful for those who are not familiar with their destination station.

Recommendations

To maintain a successful system, frequent maintenance is imperative. Should the need arise for BRT system diversification in Johannesburg, other lanes should be implemented using other forms of the BRT system and bicycle and car parking should be adopted at the main station. If there is further population intensification, articulated standard buses should be adopted. Smart cards should be used exclusively and will enable commuters to load more than a day's fare, depending on their financial capacity. Other modes of BRT, especially the segregated mode, should be employed for future BRT implementation. Although cost effective, the cost of the BRT system is justified by the high levels of efficiency, reliability and speed.

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