



Workshop 2 Report: Bus Rapid Transit

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ARTICLE INFO

Article history:

Available online 17 October 2014

Keywords:

Bus Rapid Transit
Transportation policy
Institutional reform
Project implementation
Paratransit

SUMMARY

Workshop 2 examined critical success factors, operational enhancements, appropriate contractual and institutional settings and complementary policies of BRT systems, building off the discussion started two years before in Durban. Even though implementing a BRT corridor is almost always very challenging, the evidence shows that the BRT industry is quite lively and growing steadily in kilometres and daily ridership in all continents. The Workshop identified six cyclical stages for BRT implementation: policy, frameworks, strategy and planning for implementation of BRT, stakeholder outreach and process management, deployment and operationalization of BRT, and post-deployment assessment. The papers and discussion provided key examples and results in all of the six stages leading to eight key messages. These main points ranged from an optimism that BRT is spreading, but that BRT is not itself the objective; the need for innovation in not just operations, but regulatory, institutional, and participatory frameworks, which requires increased public and private capacities; and recognition of the differences between cities, particularly in the developing and developed world. The workshop identified policy recommendations and suggested some specific research topics for Thredbo 14.

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1. Thematic overview

1.1. Introduction and scene setting

This paper reports on Workshop 2 of the 13th Thredbo Conference, held in Oxford during 16–20th September 2013. The workshop was dedicated to issues related to Bus Rapid Transit. The workshop consisted of presentations based on a set of pre-submitted papers (see reference section below), followed by discussions both about the individual papers and of broader issues arising. In total, 14 papers were submitted and presented to the workshop, along with one unscheduled presentation. A further two papers from the Plenary sessions have been included in the discussion and analysis. There were 25 participants in the workshop.

The pre-workshop description was as follows:

“This workshop will provide an update on BRT systems around the world and considerations of related concepts such as Corridor Dedicated Transit. It will examine critical success factors, operational enhancements, appropriate contractual and

institutional settings and complementary policies. It will also consider BRT as an agent of transformation of urban transportation, both of the services and of the transport operators, and the way BRT may evolve from existing operations. It will consider the adaptation of institutional and regulatory frameworks for BRT; or in many cases in developing countries where no adequate framework exists, establishment of a permanent or interim framework sufficient for BRT. Business models for BRT, including system financing, contractual arrangements, use of PPP, and allocation of risk, will be discussed. The impacts on and interaction with pre-existing transit operators, including paratransit, will be examined. Consideration will also be made of the users of BRT systems and how they may be better involved in system design.”

1.2. Key findings from the Thredbo 12 Workshop on BRT

The Thredbo 12 Conference (Durban, 2011) was the first to have a workshop dedicated to BRT. Consequently, a significant part of the workshop dealt with ‘what is BRT and what can it achieve?’ as with ‘what are the institutional, regulation, ownership and competition aspects of BRT?’, how is it organised? Many of the papers and the discussion at that workshop dealt at least as much with transportation policy and with the design and operational dimensions of BRT as they did with the core Thredbo themes. Nevertheless, this

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was important for the Thredbo community to appreciate that BRT is significantly more than improved bus services, both in its transportation characteristics and its organisational aspects.

This dual approach was reflected in the workshop findings, which were extensive. Some key findings are presented here for context and continuity:

- Cities urgently need mobility improvements, which must meet the need for door-to-door connectivity. BRT must be conceived as part of a multimodal mobility system.
- To effectively address mobility challenges using BRT, it is essential to understand the transportation needs and the policy objectives for BRT implementation.
- All dimensions should be considered – institutional, financial, operational, etc.
- Successful examples are vital as inspiration, but they need to be customized to the host environment rather than simply imitated.
- Context matters, implying constraints and opportunities to the process.
 - Desirable ingredients for success include the existence of national transit policy and guidelines, political leadership and support, a sufficient institutional framework and stakeholder buy-in.
- BRT transition and implementation may be difficult as many actors are involved.
- BRT has often been expected to solve many problems beyond the transportation task.
- The BRT concept is flexible and can be adapted to a wide variety of contexts.
 - Capacity can reach over 45,000 passengers per hour per direction (pphd) by using passing lanes and large stations, although this is exceptional.
- Stations and intersections need to be properly engineered to increase capacity.
- Express services are crucial to improve capacity where high throughput is required. They also improve quality of the travel experience and reduce costs.
- Headway control is crucial in the performance in terms of waiting time, travel time, reliability and comfort. Weak control can require additional buses and resulting higher operating costs.
- Capital investment requirements for BRT are significantly lower than rail-based modes. They can also be phased and could be less vulnerable to funding issues than ‘all or nothing’ systems such as LRT.
- BRT is leaving its pioneering phase and needs some more formalization within both institutions and policies.

1.3. Core themes of the current Workshop

The findings and research recommendations of Thredbo 12 in 2011 were reviewed and deemed to still be relevant to the Workshop. It was noted that all of the core themes of Thredbo – competition, ownership, regulation, contracting, institutions and relationships – intersect around BRT. Indeed, especially in developing and emerging countries, BRT is often a stimulus of change in these domains. Thus, BRT needs to be viewed as more than a transportation mode, and as a powerful agent of transformation for urban transportation.

On that basis, a two-way overarching theme was proposed:

- What can BRT take from the Thredbo experience?
- What can BRT give to the Thredbo community?

1.4. Key reference materials on BRT

This paper does not deal with the design or operational aspects of BRT, except where they are relevant to the workshop strands. The interested reader is directed to the following resources, as examples of the growing sources of available information:

- BRT Centre of Excellence at www.brt.cl
- EMBARQ at www.embarq.org
- ITDP at www.itdp.org
- National BRT Institute at www.nbrti.org
- Buses with a high level of service (BHLS) at www.uitp-bhls.eu

2. Integration of the key themes of the presented papers

The workshop papers describe different phases of the lifecycle of BRT deployment:

- Policy development
- Frameworks
- Strategy and planning for implementation of BRT
- Stakeholders, outreach and process management
- Deployment and operationalization of BRT
- Post-deployment assessment

These phases are sequential, but they are also cyclical. In particular, post-deployment assessment provides essential feedback to policy-making, investment decisions, systems design, operational methods and stakeholder management strategies (Fig. 1).

The relevant issues emerging from the papers and presentations are presented in this section for each of the six strands. The broader issues and findings are then presented in the subsequent sections.

2.1. Policy

- Browning argues that individual modes (such as paratransit) should be upgraded while work is being done to implement integrated systems. This allows for service improvements while long-term projects are being carried out.
- Dantas demonstrates with the case of Brazil that policy and decision-making between modes can be influenced by investors, in particular new entrants from outside the transport sector are pushing PPP for rail projects and existing bus

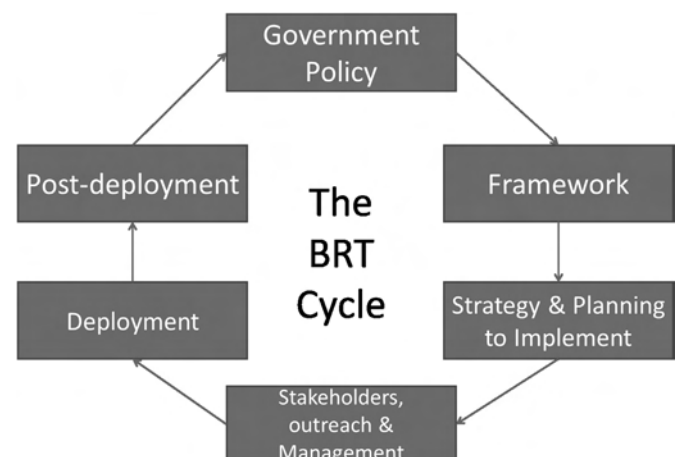


Fig. 1. The lifecycle of BRT deployment.

operators lack the sophistication to presenting competing projects like BRT.

- Filipe and Macário propose a methodology to evaluate policy packaging for the implementation and management of BRT, with the goal of identifying the relationship between system performance and the policies and institutional design of the project.

2.2. Frameworks

- Gyamera, Konadu, and Finn present the process of implementing a new regulatory framework in two urban areas in Ghana. It was based on 5 pillars, but even the minimum level of creating the legal basis, setting up regulators, and establishing permits for all routes posed a challenge.
- Brader and Finn examine the institutional and organizational capacity challenges of the design and implementation of BRT in the Philippines. New frameworks will have to be developed as there is no tradition of urban transport agencies or exclusive operators. A key concern is how to include the existing jeepney operators.
- Finn outlines different cases where BRT has made significant changes to the existing institutional, regulatory, financing or participatory frameworks. In addition to operational advancements, BRT can require or push innovation in existing regulatory and institutional frameworks.
- Rizvi and Sclar emphasized that process matters. It is not just what is implemented, but also how BRT is implemented that influences outcomes. The planning process is three dimensional; it must consider approach (strategy) and timing in addition to the series of steps to be performed.
- Kaenzig explained that there are currently no urban passenger transport agencies in the cities of the Philippines, nor is there a tradition of exclusive (i.e. single operator) permits/franchises for routes. Whilst route franchises are issued to existing jeepney and bus operators by the Land Transport Franchise Regulatory Board (LTFRB), an agency of the national Department of Transport and Communications (DOTC), this only gives permission to operate and does not define service standards or hours/days of operation. This presents challenges to the franchising and regulation of BRT operations.
- Hidalgo discussed the cases of Cali and Bogotá, highlighting the importance of political leadership, adequate technical planning and funding for the implementation of integrated systems, inclusive of BRT. The two cities have benefited from strong leaders, capable planning teams and financial support from a National Programs. They have created dedicated institutions (special purpose vehicles) to manage implementation and control operation, and have relied on the private sector for bus services. Giving financial constraints, productivity has been prioritized over service quality, resulting in high occupancy and user complaints.

2.3. Strategy and planning for implementation of BRT

- Rizvi and Sclar suggest that the BRT planning process (i.e. how a project is planned and implemented) is an important determinant of project success.

It impacts, and is in turn impacted upon by design, institutional and political conditions to influence outcomes – as well as having its own direct influence on project outcomes. Understanding the importance of planning process to BRT success is a first step. More

work is required to understand which strategies to BRT planning work best in which contexts. This knowledge has the potential to vastly improve BRT success.

- Gyamera et al. discussed the first step of the transition from informal, self-regulated transit in Ghana which was to develop bus corridors to demonstrate the viability of formal operations. BRT is seen as a later step, but permits are being established to prepare for larger vehicle service on important corridors.
- Hidalgo suggests that corridor-by-corridor BRT implementation has limited impacts in developing cities with disorganized and unregulated public transport services. There is a need to reform the citywide public transport provision, following Transantiago, but taking care of the issues observed there. In the cases of Cali and Bogotá in Colombia, implementation of the integrated systems has been protracted, due to policy discontinuities – resulting from changes in local leadership – and opposition of affected stakeholders – mainly traditional private public transport providers. The integrated systems in the two cities, however, are showing overall positive impacts, but underscore the need for shorter time frames, to meet user expectations and reduce overall implementation costs – for the city and the private operators.

2.4. Stakeholders, outreach and process management

- Rizvi and Sclar describe the outreach and education campaign that the promoters of BRT undertook in Ahmedabad, India. This included soliciting feedback from the public, working with the media, reaching out to different community leaders, and having a three month free trial period for riders to test and understand how to use the system.
- Ka'bange, Mfinanga, and Hema discussed the need for formal public transit in Dar es Salaam, Tanzania and how plans for a rapid transit system were opposed by some city residents. The reason was due to the lack of a legal and regulatory framework for land use planning and property compensation and resettlement. An inclusive process for stakeholders and dissemination of information are needed in addition to fair compensation for land.
- Gyamera et al. explains the successful process used to move paratransit operators into a regulatory framework in Ghana as a step toward BRT.
- Dantas explores the entry of new investors in urban transportation projects in Brazil. Corporate interests from outside the transport sector are investing in (and advocating for) new PPP projects, but primarily in rail. In most cases, there are institutional barriers between the existing bus operators and the government and new entrants. BRT is limited in part because the existing operators do not have the experience of designing infrastructure and technological based service and advocating for funding.
- Browning suggests that individual vehicle owners of existing paratransit should be assisted to form cooperative semi-formal companies with a special fund to help meet the costs of the transition and a starter service using the existing vehicles.
- Brader and Finn explain how the organizational structure of the existing paratransit service in the Philippines limits their ability to formalize or form ownership units to participate in BRT service. At the same time in cities with a tradition of informal transit, a deep understanding of the relationship between travellers and the existing mode is necessary.
- Kaenzig explained that the development of BRT in Cebu was characterised by a continual programme of consultation that has raised awareness and support. A level of expectation and

excitement was developed, and this momentum must be maintained. To a certain extent there is pressure from users on politicians to deliver something that they themselves have identified as much needed designed to achieve partial depoliticisation of the proposal.

- Seftel and Rikhotso argue that although there have significant pains in the way the negotiated contract has been constructed for the Rea Vaya system in Johannesburg, the gains are still considerable. If forfeited, it would take them away from the critical transformation objective of the Rea Vaya BRT. They consider that the answer does not lie in moving away from a negotiated contract but rather in continuing to develop their approach to a negotiated contract, the terms of such a contract and the enabling environment within which the contract is negotiated.

2.5. Deployment and operationalization of BRT

- Lindau, Hidalgo, and de Almeida Lobo (plenary session paper) review implementation of BRT in multiple developing city contexts and indicate that it faces several problems associated with institutional and financial frameworks. They indicate that systems face complex planning environments (multiple agencies, multiple jurisdictions and different levels of government); lack of alignment among stakeholders; perception of BRT as a lower quality mode; traditional bias towards road capacity expansions; and lack of community participation. BRT also faces implementation barriers, including optimism bias; discontinuities due to political cycles; lack of national policies supporting BRT development; insufficient funding for adequate implementation; and, very often, rushed inauguration of incomplete systems. Recognizing these issues and barriers is valuable for advancing deployment.
- Rizvi and Sclar explains how Ahmedabad, India used a strategy of connecting busy places but avoiding busy roads in order to avoid conflicts over road space experienced in Delhi. They also focused on building a network and not just a corridor and made pragmatic decisions to change the route and design when facing conflicts. Learning from the problems in Delhi they also focused on enforcement and training of staff. Globally, certain techniques or approaches to BRT deployment and operationalization have not only built public and political support, but have also improved design by integrating feedback processes, without over-burdening existing institutional capacities. There is an unrealized opportunity to build on these experiences and apply to other contexts. What is needed is more systematic attention to issues of planning and implementation (i.e. how, not just what).
- Clifton, Mulley, and Hensher examine a series of proposals for rail service to a residential area of Sydney to see whether, as the proposed project changed over time, the benefits for transit users improved. In particular if the rail project now under construction provides better frequency, travel times and fares compared to the existing express bus service. The results found that some users fared better with rail service and some better with the existing bus service or other proposals.
- Kaenzig discussed that building of the BRT will involve Right of Way acquisition, although this is mainly restricted to station, depot and terminal areas. The potential positive impact on land values presents potential opportunities of working with developers to in land procurement and construction. The Jeepney sector will be impacted, and some operators will be displaced. Due to their fragmentation and low level of organisational capacity, the operators of the BRT services will not emerge from the Jeepney sector. Rather, the Jeepneys will continue to play the

role of citywide public transport, and some will provide feeder services to the BRT.

2.6. Post-deployment assessment

- Currie and Delbosc reviewed the performance of Australasia BRT systems from 2006 to 2013. The systems range from busways to on-street service but both generate good ridership; segregated lanes do improve speed, reliability and attract the highest ridership per km. Frequency has a strong influence on boardings per vehicle km.
- Browning argues that there should be mid-term reviews of long-term action plans; these reviews would consider the proposals in the long-term plans as interim stages.
- Hensher, Li, and Mulley used random effects regression with data from 121 BRT systems to model variables impacting BRT ridership. Significant variables included fare, frequency, station spacing, pre-board fare collection, and location of doors. Another model also identified that higher frequencies exist on corridors with high density, more trunk lines, and bus priority infrastructure.
- Munoz & Batarce (a) reviewed Transantiago five years after its launch. Despite initial problems the new system has integrated and formalized transit service reducing externalities significantly. While it still faces challenges like reliability of bus service, low bus speeds due to lack of dedicated infrastructure, fare evasion and poor public perception, Santiago's experience has provided valuable lessons to other cities.
- Munoz & Batarce (b) developed a methodology to compare levels of service in multiple cities that provides a comparison even when different data is available in each city. They use a representative sample of trips in each city and define level of service with a range of variables including speed, frequency, travel time and waiting time.
- Rizvi and Sclar pointed out that post deployment assessment needs to extend beyond traditional evaluation of design (technical and financial), political and institutional issues, and also consider 'how' the project was implemented – i.e. the planning process – timing (duration and moment of action), strategy and tactics employed, and steps undertaken (content and sequencing).

3. Workshop discussion

Arising from the paper presentations and discussions, a set of findings or 'take-aways' emerged. This consisted of seven findings identified by the group, plus a further finding that became evident from the discussions themselves.

- 1) Despite the challenges faced in all locations, BRT can be implemented and is increasingly widespread.
- 2) What is needed to achieve success, when success is not at all guaranteed?
- 3) The BRT itself is not the objective, but it is often necessary to clarify what is.
- 4) Institutions, regulations, contracts, public participation and political leadership must be aligned, some of which require novel solutions in the host environment.
- 5) It is necessary to win the hearts of citizens.
- 6) Key capabilities must be developed.
- 7) If you succeed, the rewards for the city are very significant.
- 8) There are significant differences between BRT in the developed and developing world (*or 'mature and emerging systems'*), in particular in terms of frameworks and goals.

These items are developed in the following sub-sections.

BRT and busway systems in the world

➤ 161 cities worldwide

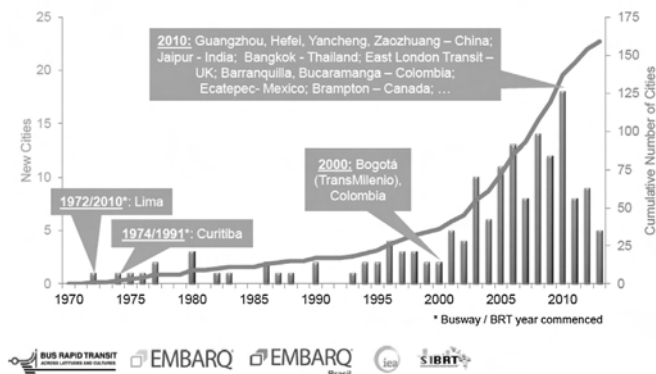


Fig. 2. Number of BRT systems opened by year (1970–2013).

3.1. Despite the challenges faced in all locations, BRT can be done and is increasingly widespread

The number of BRT systems has increased steadily since the mid-1990's, with an average of about 10 new systems opening each year over the past decade (see Fig. 2).

As of November 2013, the Global BRT Database (www.brtdata.org) includes 168 cities with 324 corridors and 4489 km of BRT and bus corridors. These systems serve more than 30.8 million passengers every day. The highest concentration is still in Latin America (56 cities, 19.5 million passengers per day), with Asian countries catching up fast (35 cities, 8.1 million passengers per day). Bus priority has a long tradition in Europe, with 43 cities (1.7 million passengers per day) USA and Canada, with 24 cities (890,000 passengers per day) and Oceania, with 7 cities (330,000 passengers per day). New systems are being implemented in Africa and the Middle East.

BRT has become an alternative mass transit mode in multiple cities and part of multimodal networks, but is still a recent phenomenon: 131 cities (78% of the tally) implemented systems since 2001.

BRT is implemented within a very wide range of institutional arrangements. In some cases, BRT is implemented within existing frameworks. In developing countries, it is often the case that the implementation framework and operator structure is developed as part of the BRT deployment (Finn, Brader, Gyamera, Olyslagers).

3.2. What is needed to achieve success, when success is not at all guaranteed?

The workshop suggested that BRT required the existence of national transit policy and guidelines, political leadership and support, a sufficient institutional framework and stakeholder buy-in. Two new items were added to this list: planning (Rizvi) and integration (Hidalgo, Batarce...). Still the participants recognized the difficulties and suggested some strategies for overcoming them: adequate involvement of stakeholders, better outreach and clear communications (Hidalgo).

It is essential to have a better understanding of successful approaches to planning and implementing BRT systems. BRT is not just a matter of technical design and project management. It is a major policy, institutional and political issue, and this is especially true in developing countries. To be successful, it is necessary to

understand these dimensions and whose interests are at stake, and to build strategies around these factors (Rizvi).

In developing countries, the channels and mode of dialogue with the industry sector are important factors. Even where these are a transport regulator, it does not have the same level of authority or enforceability as in developed countries (although it should be noted that labour unions in developed countries can delay projects just as effectively and intransigently as paratransit unions can in developing countries). In countries with strongly organised paratransit, the sector asserts itself strongly and will demand both a key role and significant concessions. This is evident in countries such as South Africa (Seftel, Browning), Chile (Munoz), Ghana (Gyamera) and Nigeria (Finn). In contrast, there are other countries where the paratransit sector is pervasive but fragmented, and in which there is no obvious mechanism for dialogue or reaching binding agreement with the sector. This is evident in countries such as Tanzania (Mfinanga) and the Philippines (Brader). Somewhat surprisingly, the latter are countries where there is a formal permit system for paratransit. This results in counter-intuitive outcomes where situations with strong and aggressive paratransit unions are ultimately amenable to agreement and active participation in the BRT (albeit at a high price and sometimes with loss of life), whereas situations with passive and fragmented paratransit can lead to protracted and fruitless efforts at engagement, and to impasse.

Compensation has become a core issue in BRT implementation in South Africa. This has resulted in a very high and unsustainable cost to implement BRT (Seftel, Browning). In most other countries, a different approach has been taken where the paratransit and informal sector stakeholders are assisted with direct participation in the BRT, as in Colombia (Hidalgo), Chile (Munoz), Ghana (Gyamera). Alternatively, there is support to transition to new routes or to different means of livelihood as in Bangladesh (Olyslagers) or Philippines (Brader, Finn).

BRT projects in developing countries inevitably have many "soft factors". These are issues that range from the unpredictable to the highly sensitive. Unlike technical design issues, they are hard to quantify or control, and their outcome is uncertain. While it is essential to have a well-developed strategy and the commitment to implement it, it is equally essential to have a "review stage" to take stock of whether the strategy is working and whether adjustment is required. This has been evident in South Africa where initial expectations for BRT deployment and stakeholder participation have not been met (Browning).

Political support is important, but so too is realism, consistency of vision, and consistency of political direction. In South Africa, there has been genuine support for BRT, but the political positions have not been without problem. Commitments given by the national Minister that there would be no loss of jobs and no loss of earnings have undermined negotiations and led to serious escalation of the compensation costs of implementing BRT. The imperative to implement BRT to deliver the football World Cup in 2010 has not been sustained in financial support thereafter. Changes of national or state Ministers can lead to everything being off the table again (Browning, Cronje, Mahlangu). It is also necessary to be convinced that the BRT will work (Mahlangu).

In Brazil, which also implements many BRT projects for the 2014 football World Cup and the 2016 Olympic Games in Rio de Janeiro, there are similar practical challenges. In addition, the sudden availability of large amounts of finance and the imperative to deliver key infrastructure brings new players to the table whose primary goal is to gain the available contracts. This presents a new set of challenges, both to the transport authorities to obtain the needed system quality, and to the established transport providers to avoid being squeezed out (Dantas). A further

challenge in these exceptional situations is the strong promotion of transport solutions that would normally be immediately rejected. To quote one mayor in Brazil – “every day someone offers me a monorail”.

From the policy perspective, the big challenge is whether BRT will be the chosen “tool” to win the battle. BRT requires and can achieve a high level of design, technology and financing. The transportation stakeholders need to (and can) raise their game, learn new things, develop capacity and deliver the product. However, having developed the plans and shown they can deliver in a cost-effective manner, Government can just move on and instead adopt different and more capital-intensive solutions, and ignore the BRT offer (Dantas).

Sometimes a rather coercive approach is effective. In Cali, the contract period was set at 25 years. Whether or not this was optimal or fair, it certainly sent a very clear signal to the operators to “be in or be out”. It provided a very strong incentive to the operators to participate, and to form the necessary set of consortia from indigenous operators that would gain the contracts (Hidalgo).

The effectiveness of the “big bang” approach remains uncertain. It is clearly a high-risk strategy, whose outcome cannot be known until after the event. It has been reasonably successful in Cali (Hidalgo), very successful in Seoul (Finn), but seriously problematic in Santiago de Chile (Munoz, Hidalgo). In the case of Santiago de Chile, the failures were at least as much due to the determination to proceed when key elements were clearly not ready as to the concept itself. Nonetheless, having got it wrong, it has been extremely difficult to recover from the reputational and financial damage (Munoz, Hidalgo, Finn).

The problems experienced at Santiago de Chile have been well documented in previous Thredbo conferences. In the main, they have been addressed and the system elements which should have been in place at system launch are now in place. However, there are two issues which were not foreseen that are now firmly entrenched. First, the system was forecast to operate on a break-even basis, but the deficit is currently about 40% of total costs. This funding challenge is explained because the system is expected to cover not just operational costs, but also one third of new Metro lines investments, bus terminals and two thirds of the student fares. Second, there is a very high level of fare evasion, estimated at about 20% in bus trips.

Finally, it seems that if BRT is correctly designed and implemented, the rewards for the city are very significant. In Australia, BRT growth has performed well above the trend for public transport. There is significant momentum both in kilometers of BRT implemented and in ridership (Currie).

3.3. BRT itself is not the objective, but it is often necessary to clarify what is

Policy packaging is essential to effective BRT deployment. It is well recognised that BRT is more than just a transportation technology. In developing countries, it is often implemented as much as an agent of transformation as a transportation tool (Gyamera, Brader, Rizvi, Munoz, Finn). In developed countries, it is often implemented as part of integrated passenger transport programs, or to stimulate urban development within TOD programs (Currie, Filipe, Seftel).

A comprehensive structure for policy packaging centred on BRT is currently in development, which offers a valuable tool for urban policy-makers (Filipe). A methodology for identifying the driving factors for BRT is also currently in development (Hensher).

There is some opinion within the industry sector that while BRT is a very welcome development, the way in which authorities

espouse it has diverted attention from what may be termed the “lower order” forms of passenger transport. This means that the investment and management attention is placed exclusively on the BRT, while the regular bus lines and paratransit (that collectively carry far more passengers) are ignored. This issue was also identified in Thredbo 12.

3.4. Institutions, regulations, contracts, public participation and political leadership must be aligned, some of which require novel solutions in the host environment

Ahmedabad has been singularly successful in aligning political, institutional, operational and public opinion aspects towards the BRT system. This can be attributed (at least in part) to a shrewd management of the project development. It is postulated that the key has been to go beyond the traditional ‘linear’ or ‘sequential’ planning approach, and to instead handle in parallel three dimensions: (1) the traditional steps of project planning (“what to do”); (2) careful attention to timing and sequencing (“when to do”); and (3) good strategy and tactics, that give great care to stakeholders and sentiment (“how to go about it”). The outcome has been not only successful implementation, but also that classes of people in India that would not normally interact can agree on and use the BRT together (Rizvi, Finn).

Also in Ahmedabad, there has been a strong institutional aligning. The city administration is well aligned institutionally and politically with Gujarat State. Janmarg BRT is established as an SPV owned by the city. Its Board is essentially the core members of the Transport Committee that organises all other public transport in the city, which can be very fractious and politically motivated. However, when the members meet as the Board of Janmarg they are compelled to focus on the interests of the BRT, and they have been very effective (Finn, Rizvi).

The institutional frameworks may also change after the implementation of BRT. This is especially visible in Australia, where all systems have been implemented in frameworks with some form of direct government control, but in all cities except Brisbane the framework has subsequently shifted to private sector orientation (Currie). The converse also holds. In Australia, there is a clear imperative to invest in transport, but the political advantage is in modes that have high expenditure and receive high media profile (Clifton, Currie).

In the Philippines, the institutional and regulatory frameworks have needed realignment to support the implementation of BRT. At one level, it has been necessary to provide a role for the city in the organisation of public transport where until now it is exclusively a national ministry function. At another level, the regulatory framework is being adjusted to allow for exclusive route licences where previously only a franchise system was provided for. Since there is a single framework for all surface public transport in Philippines, this requires a careful design to avoid unintended consequences (Brader, Finn).

In Ghana, there has been a complete re-regulation of the public passenger transport in the two main cities of Accra and Kumasi. This has been instigated by the BRT project. The paratransit sector has accepted to move from a self-regulating situation to one where the cities are the regulatory authority, and to accept a new route licencing regime. Within this framework, both the BRT and higher-quality bus services can be implemented, and also a general uplifting of the paratransit sector can be achieved (Gyamera).

In Tanzania, DART Agency is a dedicated agency established to implement BRT in Dar es Salaam. It has been given specific authority to plan, deliver and manage a network of BRT corridors in

the city. While the national surface transport agency SUMATRA remains as the regulator of services and fares, DART Agency implements the BRT (Mfinanga).

There is value in developing a more systematic understanding of how different contexts have dictated different approaches to these issues and how these decisions have impacted outcomes (Rizvi).

3.5. *It is necessary to win the hearts of citizens*

In India, there has been a strong contract between Ahmedabad and Delhi. In Ahmedabad, the BRT has received very high acceptance from the public, society groupings and at political level. The system is called Janmarg (“the people’s way”) and is accepted as cutting across classes and other boundaries. It is seen as a transport system and has received positive media coverage at home and international praise. By contrast, the Delhi BRT has been mired in controversy from the outset, and has been the target of media criticism. Despite a high level of technical design, it has singularly failed to gain public and political support. The consequence is that whereas Ahmedabad has been able to progress to significant system extensions and is now more than 80 km of BRT, Delhi remains at just 6 km of BRT (Rizvi).

Promptness or delay in implementation may also be a factor. In Delhi, the project duration has been very long. From one side, this has led to a certain fatigue among the public. From another, there has been too much change in key people (Rizvi). The same has been observed in Accra where the BRT has also taken far longer than the original projection, and all original personnel have moved on (Gyamera, Finn).

In Delhi, the Metro became quite adversarial towards the BRT, and vice versa. This meant that there was not a unified position in relation to public transport, and led to very visible discord. By contrast, in Ahmedabad the promoters of Janmarg specifically excluded the area of proposed Metro from their design, and avoided any conflict at public or political layers (Rizvi, Finn).

In Australia, BRT has been broadly successful in winning “hearts and minds”, but the results are mixed. In Adelaide, there has been high success. In Brisbane, the attitude is positive, but long queues at the river bridge are a tangible issue. In Melbourne, the BRT is popular, but people still prefer the long-established tram system. In Sydney, BRT has not succeeded to capture the public interest, and is now being replaced by a rail-based system (Currie, Clifton). It may also be an issue of visibility. The impact at an individual BRT or bus stop may be quite modest, but when summed across the entire city it can be substantial. This may be overlooked in public opinion (Currie).

In Sao Paulo, public support was built in a quite different way. The initial step was to implement conventional bus lanes in smaller streets. This enabled buses to move more freely and offer a better service. The principle was demonstrated and accepted, and this achieved a higher public support for the more significant BRT measures (Lindau).

In Bogota, the Transmilenio system is the world’s highest capacity BRT system, and perhaps the most technically successful. Nevertheless (or perhaps because of this), there is a level of dissatisfaction among users at issues such as overcrowding and unpleasant travel conditions. The political commitment to BRT under former-Mayor Penalosa has dissipated, and the political position now oscillates between strong support for replacement by Metro and delays in refurbishing the BRT (Hidalgo).

There are innovative approaches to building public enthusiasm and support that have been employed in different BRT systems (e.g. pre launch free trial operations in Ahmedabad, and prototype station construction to solicit feedback). A better understanding of the

successful techniques and tools is likely to improve BRT outcomes (Rizvi).

Ultimately, the issue may be to properly understand the decision-taker, and indeed to identify who is the real decision-taker. It is all very well to formulate arguments and justifications for BRT, but unless these anticipate and are well-directed to the real decision-takers and opinion-formers, BRT risks being marginalised (Patch, Finn).

3.6. *Key capabilities must be developed*

Public transport development and integration is complex. It requires a good combination of three essential factors (1) political leadership; (2) technical capacity; and (3) funding. If corners are cut during planning, a city will pay for it during implementation (Hidalgo).

Analysis of 121 BRT systems indicates that the three primary factors are frequency, connectivity and visibility (Hensher). The priority for passengers is to get to their destination. Time is important, but must be calculated as the sum and variance of all the parts of the journey, and not just the speed of the trunk section of the BRT. Seating availability is also important, especially in developing countries where most paratransit users have a seat (Finn). Technical capacity must be developed within the project implementers. Once developed, it must be retained. This is a serious challenge in developing countries (Manana).

The essential elements for BRT are: (1) Central Control; (2) Mass Transit image; (3) Efficient bus operations; (4) Performance- and customer-oriented management; and (5) a commercial business model. The critical design elements are: (1) Adequate station capacity and intersection control; (2) overall system capacity; and (3) commercial speeds (Ollyslagers).

Forecasting of ridership, revenues and costs needs to be developed further. In practice, this is quite weak. For example, in one Brazilian city three different studies were performed and each produced a significantly different forecast (Dantas). Operational systems need to be strengthened both at the bus operations control centres and the traffic signal controls. It is not unusual to encounter signal cycle times in excess of three minutes, such as in India and Indonesia (Finn) whereas the combined bus frequency is less than 20 s. AVM and traffic control systems need to be redesigned for the intensity of BRT operation, and to reflect the extreme usage and impact on operational and financial performance. For example, in a high-intensity BRT system, every traffic signal could be activated 8 million times per direction over the system lifetime. Even minor improvements in effectiveness could yield large benefits, and would justify significant development investment (Finn).

3.7. *There are significant differences between BRT in the developed and developing world (or ‘mature and emerging systems’), in particular in terms of frameworks and goals*

First, it must be acknowledged that there is a very wide range of practice in BRT globally. Although the number of BRT systems worldwide now approaches 200, it has been very difficult to define what exactly is “BRT”? There is often heated debate about what qualifies as BRT, and definition efforts such as the “BRT Gold Standard (ITDP, 2014)” have not met with universal approval. Thus, difference is innate to BRT.

Second, it must also be acknowledged that there can be a very wide range of practice of BRT even within the same country. This is not only at the technical and operational levels, but also even in terms of the institutional arrangements. This is particularly evident in countries of a federal nature where different states may have

Theme	Recommended research items
Creating the conditions for acceptance of BRT	<ul style="list-style-type: none"> • Identification of the “<i>key to success</i>” elements on which policy-makers and practitioners should focus, taking account of the context, urban scale and socio-economic conditions • Practice and effectiveness of influencing decision makers, including through the general public, by showing them an attractive but realistic vision for transit. • Research into why a wide range of stakeholders (public, politicians, media, incumbent operators...) unconditionally support rail systems and may be hostile towards proposals for bus-based transit; and into how such attitudes are formed or promoted.
The contribution of BRT to achieving urban and transportation policy goals	<ul style="list-style-type: none"> • Systematic gathering and analysis of evidence regarding BRT economic and social impacts. (It was noted that in some countries the capital investment for a BRT may be below the threshold at which in-depth impact analysis is mandatory, so that evidence of impacts is not available for BRT whereas it always would be for rail-based projects). • Review and assessment of projects/ programs that were specifically intended to be transformative, identifying gaps between what cities planned and what they actually delivered. • The effectiveness of BRT in land use densification, and relevant influencing factors. • Assessment of which land use planning features or policies should complement the public transport intervention (context dependent). • The effectiveness of BRT in influencing car or motorcycle use or ownership, and the specific policy measures can boost its effectiveness.
Relationships with the existing transport operators	<ul style="list-style-type: none"> • Examination of the relationships between BRT and paratransit including: (i) the roles that paratransit can play in a BRT-based transit network; (ii) development of options for a hybrid system, and assessing their feasibility; and (iii) whether the paratransit sector can be formalized in the absence of or independent from BRT. • Transversal study in how the incumbent operators evolve into (or are displaced by) larger transport operators.
Financial sustainability of BRT	<ul style="list-style-type: none"> • Policy and practice regarding financial viability of BRT and subsidies, including (i) conditions under which BRT systems can recover all operational costs, including vehicles; and can recover operational costs and system management costs; (ii) the tariff levels at which BRT can be self-sustaining; (iii) the magnitude of subsidies in BRT systems, and comparison to pre-project forecasts; and (iv) comparison of the financial

(continued)

Theme	Recommended research items
Organisation and operation of BRT	<ul style="list-style-type: none"> • performance of BRT with the modes it replaces or displaces. (Note that this is not about whether subsidies are desirable or justified in themselves). • Business models for BRT, and the extent to which they are structured to encourage optimal service, quality and commercial performance. • Organisational and technical capacities required for the BRT implementation agency. • Assessment of practice and any evidence on whether and when a trunk and feeder system may be more or less preferable to one based on direct service. • Assessment of practice and effectiveness of how complicated networks and services are explained to users. • Safety design and related operational guidance for BRT operation and infrastructure. Specific items include safety for standee passengers in higher-speed buses, and the interaction between BRT buses and soft modes. • The relationship between system design and universal accessibility, in particular in high-intensity BRT system.
Understanding the diversity and needs of the customer base	<ul style="list-style-type: none"> • Enhanced understanding of the needs of different user groups (including children, elderly and women) whose travel patterns and personal requirements may not be the same as the commuters for whose mass movement BRT is usually designed. • Practice and possibilities for product and market segmentation in BRT (e.g. air-conditioned buses, seating-only buses), and whether such segmentation is desirable.

quite different approaches – e.g. Australia (Currie), Brazil (Dantas) and India (Rizvi).

That said, it remains that there are some fundamental differences that go beyond normal variance between BRT in the developed and developing worlds (some flexibility is required on where to position countries of Latin America). This is especially evident at four levels:

- 1) Developing countries more typically have rapidly growing cities and underdeveloped infrastructure. For them, BRT is an essential and affordable form of mass transit, which can be implemented in the same timescale as the urban growth. This is reflected in more ‘massive’ infrastructure and intensive services – e.g. Tanzania (Mfinanga), Accra (Gyamera), Manila (Brader), Cali (Hidalgo) and Sao Paolo (Lindau).
- 2) Developing countries typically have underdeveloped institutional and regulatory frameworks. BRT often acts as an agent of transformation, and there is at least as much effort in institutional and framework development as in organising the BRT itself. This is particularly evident where new institutional structures have been required in Accra (Gyamera), Dacca (Olyslagers), and Dar es Salaam (Mfinanga). It is also evident where significant change and realignment has been required to existing frameworks such as in Ahmedabad (Rizvi, Finn), Jakarta

- (Finn), Santiago de Chile (Munoz), cities of the Philippines (Brader), and cities of Brazil (Dantas).
- 3) In many developing countries, there is a significant paratransit or incumbent sector that needs to be included in the process. In some cases new BRT operators are explicitly formed from the existing sector, as in Accra (Gyamera), South Africa (Seftel, Browning), Jakarta (Finn), Lagos (Finn), Cali (Hidalgo) and Santiago de Chile (Munoz). In other cases, there is a general intent to offer participation opportunities that could be difficult to achieve in practice, or there is an upfront acknowledgement that the sector does not have the capacity to provide the BRT services and is otherwise relocated or compensated, as in Philippines (Brader) and Brazil (Dantas).
 - 4) In developed and self-sufficient countries, the BRT framework, requirements and design are determined by the city or national authorities. This is seen in Australia (Currie, Clifton), Korea (Finn) and South Africa (Seftel). In developing countries, the external lending and development agencies play a strong role in financing, and also have a significant say in both the frameworks and the business concepts. This can bring advantages in access to knowledge, finance and discipline, but can also bring obligations, constraints and an added layer of administration. Such projects are seen in Accra (Gyamera), Philippines (Brader) and Tanzania (Mfinanga). At the extreme, parallel BRT projects in the same city can end up with different organisational and technical concepts due to being supported by different agencies, as seen in Bangladesh (Olyslagers).

Recognising the very different urban contexts and transportation objectives, the point of convergence between the developed and developing countries is likely to be the goal of ridership growth. Whether the underlying goal is social equity, urban sustainability, transport efficiency or commercial profit, all BRT projects seek to increase ridership and mode share. All BRT projects also seek to improve technical efficiency, throughput and service quality. These are likely to provide the points of shared interest between policy-makers and practitioners in very differing environments that do not usually collaborate.

4. Recommendations from the Workshop

4.1. Research recommendations

The workshop identified a set of recommendations for further research. Many of these issues arise from the challenges faced by policy-makers and leaders in city and national authorities who must address mobility needs within the broader urban context, and by the practitioners who must design, deliver and manage the BRT systems. The workshop highlighted the need for effective engagement among the research, policy-making and practitioner communities.

The workshop noted that most of the list of research recommendations from the 2011 Thredbo workshop remains valid. The following items were additionally identified:

4.2. Policy recommendations

The Workshop proposed the following recommendations for policy:

- At both policy and planning levels, BRT needs to sit within the development of the city itself, and the development of the urban passenger transport of the city. BRT should not be designed or deployed in isolation without regard either for its impact on its context environment, or of the opportunities that its context environment provides.

- BRT should not be burdened to solve the city's or society's problems, nor allowed to be used opportunistically by others to advance their own agendas. If BRT should be a 'problem-solver' or 'agent of transformation', this should be explicitly stated, it should be given adequate resources for the additional responsibilities, and it should receive the political backing to implement the emerging multi-faceted solution
- BRT needs to be based on coherent and efficient business models. These need to be at the heart of the design process, planned from the outset, with as much attention to them as is given to the technical aspects. They should not be an afterthought.
- For complex and extensive BRT systems, there is a need to devise an intermediate option between the current choices of "Big bang" and "gradual implementation", each of which has its merits but also contains risks of failure. Due to the limited number of analysed cases to date, this policy issue is framed as pertinent questions:
 - Does experience suggest 'big bang' approaches yield stronger long-term outcomes than incremental approaches?
 - What role does context play – under what situations should one alternative be favoured over another?
 - Are interim solutions feasible, and if so are they preferable?
 - Does experience show that fare integration is a necessary first step in all cases?
- BRT design should be appropriate to context. BRT solutions from one context, no matter how successful, should not be imposed on another context.
- Rigorous and sustained management structures and tools must be used to deliver the planned capacity and outcomes. The different needs at the planning, delivery and operational phases must be recognized and adequately resourced.
- BRT design knowledge needs to be codified and formalised, and subject to testing and rating.

4.3. Recommendations for Thredbo 14

The Research and Policy Recommendations in the preceding sections, supported by the Papers and Workshop Discussion, provide the main outputs from the Workshop. They are suited to immediate use.

There are some remaining questions that we hope will continue to be covered by Thredbo and by our community of researchers:

- How can bus transit be used as a transformative tool for cities and for transportation stakeholders?
- Have mature transit agencies (i.e. in developed countries) changed themselves or their methods then they implemented bus transit, and if not, have they missed opportunities?
- Has implementation of bus transit led to changes in policy or in perception by key stakeholders?
- Should BRT be primarily a *client of* or a *contributor to* knowledge in the core Thredbo themes
 - Competition, Ownership, Regulation, Contracting, ...
- Should we continue to have a separate BRT Workshop within the Thredbo Conference?
 - Maybe: Planning and Implementing Integrated Transit Systems and BRT?

- Should be pay greater attention to the “How” rather than the “what”?
- How do deal with the significant Developing and Developed world differences, including research and conference structures?

Participants in the workshop

The material in this report is based on the papers and the workshop contributions of the participants. The participants were Marco Batarce, Paul Browning, Aileen Carrigan, Geoffrey Clinton, Simon Cowen, Nicholas Cronje, Graham Currie, Andre Dantas, Brendan Finn (Rapporteur), David Hensher, Dario Hidalgo, Robin Kaenzig, Karl Kottenhoff, Toni Lindau, Sam Lucas, Thumbu Mahlangu, Khibi Manana, Yolisa Mashilwane, David Mfinanga, Rosario Macario, Juan-Carlos Munoz (Chair), Frits Olyslagers, Wayne Patch, Andrea Rizvi and Eric Trel. Their contributions are gratefully acknowledged.

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¹ All references from the Thredbo 13 Conference (2013), unless otherwise cited. * Papers presented in Plenary, but included in the workshop discussion and analysis.