Benchmarking South Africa’s BRTs

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Key questions
Key questions

• How do SA BRTs compare with (some) international systems in terms of operational performance?

• How do we explain any differences found?

• What does this mean for the future?
About benchmarking

Data

Indicators

Comparators
Data

- Brtdata.org
- Other published sources
Approach

Under BRT’s control

- Infrastructure
- Routes & Frequencies
- Man’gment & control
- Operating speed
- Service quality

Not under BRT’s control

- Densities
- Ridership patterns
- Perceptions & preferences

Fare policy

Utility Productivity

Financial performance

Contract price

Supply

Demand

Context

IPK = \[ \frac{\text{Pax boardings}}{\text{Service-km}} \]
Comparison: Raw IPK
Extent of trunk corridors

[Bar chart showing trunk corridor length (km) for various cities, with Jakarta having the longest and Strasbourg the shortest.]
Speed

Average op speed (km/h)

- Medellín
- Recife
- Strasbourg
- Belo Horizonte
- Goiânia
- Cali
- Quito
- Jakarta
- Porto Alegre
- Pereira
- Guayaquil
- Rio de Janeiro
- São Paulo
- Fortaleza
- Ahmedabad
- Pretoria
- Uberlândia
- Bogotá
- Beijing
- Cape Town
- Guadalajara
- Lagos
- Johannesburg
- Istanbul
- Brisbane
- Adelaide

Sources: BRTdata.org; Treasury; Own analysis
Service quality

<table>
<thead>
<tr>
<th>Satisfaction Criteria</th>
<th>Mean Score (out of 10)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Travel times (Arriving at your destination on time)</td>
<td>9.2</td>
</tr>
<tr>
<td>Costs (Bus fare charged)</td>
<td>9.2</td>
</tr>
<tr>
<td>Comfort (Comfort of the ride)</td>
<td>9.3</td>
</tr>
<tr>
<td>Security (Feeling safe while waiting for the bus)</td>
<td>9.3</td>
</tr>
<tr>
<td>Safety (Feeling safe when on the bus)</td>
<td>9.4</td>
</tr>
<tr>
<td>Reliability (On time arrival/departure of the Bus)</td>
<td>7.5</td>
</tr>
<tr>
<td>Appearance (Overall appearance of the bus)</td>
<td>9.3</td>
</tr>
<tr>
<td>Accessibility (Ease of getting on/off the bus)</td>
<td>9.3</td>
</tr>
<tr>
<td>Convenience (Ease of travelling with parcels/luggage/personal belongings)</td>
<td>9.1</td>
</tr>
</tbody>
</table>

Overall passenger ratings of services in %

Source: Rea Vaya, 2017

Source: CoCT CITP 2019-20
Peak frequency & utilisation

<table>
<thead>
<tr>
<th>City</th>
<th>Trunk</th>
<th>Feeder</th>
</tr>
</thead>
<tbody>
<tr>
<td>Johannesburg</td>
<td>80-85%</td>
<td>60%</td>
</tr>
<tr>
<td></td>
<td>65%</td>
<td>30%</td>
</tr>
<tr>
<td>Cape Town</td>
<td>97%</td>
<td>--</td>
</tr>
<tr>
<td></td>
<td>63%</td>
<td>--</td>
</tr>
</tbody>
</table>

Sources: brtdata.org; Rea Vaya; MyCiti
Model – controlling for external factors

Purpose:

To estimate the performance of SA’s BRTs while controlling for factors that are not under their control

Do SA’s BRTs perform similarly to other international systems under the same conditions?

➔ Need to model the impact of external conditions on BRT performance internationally
Model – controlling for external factors

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept</td>
<td></td>
</tr>
<tr>
<td>Income</td>
<td>GDP per cap</td>
</tr>
<tr>
<td>Competition</td>
<td>% PT users</td>
</tr>
<tr>
<td>Op speed</td>
<td>Avg BRT speed</td>
</tr>
<tr>
<td>Coverage</td>
<td>No of routes/pop</td>
</tr>
<tr>
<td>Frequency</td>
<td>Avg peak frequency</td>
</tr>
<tr>
<td>Land use</td>
<td>Avg metro density</td>
</tr>
<tr>
<td>Extent</td>
<td>Corridor length</td>
</tr>
<tr>
<td>Regional context</td>
<td>Latin America</td>
</tr>
<tr>
<td></td>
<td>Asia</td>
</tr>
</tbody>
</table>
Model results – controlling for external factors

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coefficient</th>
<th>t Stat</th>
<th>Effect?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept</td>
<td>-3.0535</td>
<td>-1.355</td>
<td>–</td>
</tr>
<tr>
<td>Income GDP per cap</td>
<td>0.0001</td>
<td>1.357</td>
<td>NO</td>
</tr>
<tr>
<td>Competition % PT users</td>
<td>0.0449</td>
<td>1.120</td>
<td>NO</td>
</tr>
<tr>
<td>Op speed Avg BRT speed</td>
<td>0.0218</td>
<td>0.482</td>
<td>NO</td>
</tr>
<tr>
<td>Coverage No of routes/pop</td>
<td>0.0111</td>
<td>0.397</td>
<td>NO</td>
</tr>
<tr>
<td>Frequency Avg peak frequency</td>
<td>-0.0029</td>
<td>-0.932</td>
<td>NO</td>
</tr>
<tr>
<td>Land use Avg metro density</td>
<td>0.0010</td>
<td>4.261**</td>
<td>YES</td>
</tr>
<tr>
<td>Extent Corridor length</td>
<td>-0.0207</td>
<td>-2.159**</td>
<td>YES</td>
</tr>
<tr>
<td>Regional context Latin America</td>
<td>4.2998</td>
<td>3.460**</td>
<td>YES</td>
</tr>
<tr>
<td>Regional context Asia</td>
<td>6.4958</td>
<td>4.458**</td>
<td>YES</td>
</tr>
</tbody>
</table>

R-squared = 0.82
N = 26 cities

Source: Own analysis
Comparison: Normalised IPK

![Graph showing comparison of Normalised IPK for various cities]
Contextual variables

- Land use and demand structure

Reverse Ridership %

<table>
<thead>
<tr>
<th>City</th>
<th>Trunk</th>
<th>Peak</th>
<th>Off-peak</th>
</tr>
</thead>
<tbody>
<tr>
<td>Johannesburg</td>
<td>Trunk</td>
<td>10-20%</td>
<td>29%</td>
</tr>
<tr>
<td></td>
<td>Feeder</td>
<td>39%</td>
<td>57%</td>
</tr>
<tr>
<td>Cape Town</td>
<td>Trunk</td>
<td>27%</td>
<td>--</td>
</tr>
<tr>
<td></td>
<td>Feeder</td>
<td>32%</td>
<td>--</td>
</tr>
</tbody>
</table>

Sources:
- Scocria & Munoz-Raskin, The World Bank;
- Rea Vaya, MyCiti
Infrastructure investment

Sources: brtdata.org; Rea Vaya; MyCiti; Treasury
Financial performance

Farebox recovery (Fare revenue / Bus op costs)

Sources: Scorcia & Munoz-Raskin, The World Bank; Treasury
Conclusions

- SA’s BRTs have very poor operational productivity (pax/amount of service) by international standards
- This is not primarily due to oversupply of buses or poor service quality
- Mostly explained by demand (land use, trip patterns) and contextual (competition, policy) issues outside BRT’s direct control
- Under the circumstances, BRTs are largely doing as well as can be expected i.t.o. operational productivity
- Other improvements (integration, fare policy) might make (marginal?) difference
- Some evidence of over-investment in infrastructure
- Poor financial performance driven by poor operational productivity, and (indicatively) extra costs of formalisation
Conclusions (2) – lessons learnt

• Keep and develop operational excellence at BOCs/VOCs and cities

• We will have poor performing BRTs for as long as we serve poor land use patterns

• Relook infrastructure requirements – lighter, more flexible approaches?

• Report separately BRT cost and taxi transformation cost – clearer decisions about what we are paying for
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www.up.ac.za/centre-for-transport-development