Using Business Analyst for Demographic Input into Mass Transit Planning

By: Luis David Galicia
San Diego, California July 24th, 2012
Agenda

- Background
- Problem and Proposed Methodology
- Use of Business Analyst for Transit Data Collection
- Complementary Studies for Determining Potential BRT Riders
- Forecasting BRT Ridership using the System Dynamics Theory
- Results
- Research Contributions
- Questions
Background

BRT concept first developed in Curitiba Brazil (70’s).

The expression BRT is mainly used in North America, Europe and Australia.

Source: Urban Habitat. Journal of Social and Environmental Justice
Problem

Despite its popularity, the Federal Transit Administration (FTA) is not clear regarding a recommended methodology to estimate BRT ridership.

Then how to Forecast Bus Rapid Transit Ridership?
Proposed Methodology

1. Identification of Key Elements of BRT and Corridor Characteristics (U.S. and Abroad)
2. Recommended BRT Infrastructure Features at Different Stages of Deployment (U.S.)
3. Demographic Analysis of BRT Corridors Using GIS (Los Angeles and Las Vegas)
4. Complementary Studies (O-D Survey) for Determining Potential BRT Ridership
5. Design a System Dynamic (SD) Model for BRT
6. Define Variables, Connectivity and SD Model Rules
7. Run Simulation Model
8. Analysis of Results and Model Calibration
9. BRT Ridership Forecast
10. BRT Case Study (E. Paso, Texas)
11. Incorporate Specific Variables for Case Study SD Model
12. Casestudy Analysis of Results
13. Construct a Friendly Interface for Non SD Users
14. Conclusions and Recommendations

Legend:
- Activity
- Results
Use of Business Analyst (data collection)

- Step-by-step methodology for Demographic Data extraction

1. Buffering Ring Layer from Coverage Area Analysis
2. Select Trade Area Tool in BA Menu
3. Create New Trade Area
4. Select Non-Overlapping Rings Method
5. Select Layer Containing Stores (Select all BRT Stops or BRT Stop Layer)
6. Define Ring Size (0.25 miles Air Distance)
7. Name Trade Area Output Layer
8. Name Trade Area Output Layer
9. Select BA Report Type

Output Layer and Final Report Creation
Data collection using Business Analyst
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Data collection using Business Analyst
Data collection using Business Analyst
Data collection using Business Analyst
Complementary Studies for Determining Potential BRT Riders

<table>
<thead>
<tr>
<th>Stop ID</th>
<th>Serial Number of Cards Distributed at the Stop</th>
<th>Serial Number of Cards Collected at the Stop</th>
<th>Cards With Transfer Information</th>
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</thead>
<tbody>
<tr>
<td>D1</td>
<td>1-10</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>D2</td>
<td>11-16</td>
<td>2-9</td>
<td>-</td>
</tr>
<tr>
<td>D3 (Transfer Stop)</td>
<td>17-22</td>
<td>1, 11-14</td>
<td>1, 11-13</td>
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<tr>
<td>D4</td>
<td>-</td>
<td>10, 15-16,17-22</td>
<td>-</td>
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</tbody>
</table>

Total Riders on Route D = 22, Total Transfers to Route M = 4

<table>
<thead>
<tr>
<th>Origin</th>
<th>Destination</th>
<th>Riders</th>
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<tbody>
<tr>
<td>D1</td>
<td>M2</td>
<td>1</td>
</tr>
<tr>
<td>D2</td>
<td>M2</td>
<td>3</td>
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</table>

Total Transfers = 4
Forecasting BRT Ridership using the System Dynamics Theory

“System dynamics is a methodology for studying and managing complex feedback systems”

Feedback refers to the situation of X affecting Y and Y in turn affecting X (loops) through a chain of causes and effects.
Forecasting BRT Ridership using the System Dynamics Theory
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Modeling Results Mesa St. Corridor
El Paso, TX

<table>
<thead>
<tr>
<th></th>
<th>EMPLOYMENT</th>
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<th>POPULATION</th>
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<tbody>
<tr>
<td></td>
<td>2008</td>
<td>2010</td>
<td>Growth Rate</td>
<td>2008</td>
</tr>
<tr>
<td>0 to 0.25-Mile</td>
<td>5,216</td>
<td>5,171</td>
<td>-0.00432299</td>
<td>13,478</td>
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<tr>
<td>0.25 to 0.50-Mile</td>
<td>7,643</td>
<td>7,732</td>
<td>0.00580547</td>
<td>21,257</td>
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</table>

<table>
<thead>
<tr>
<th></th>
<th>SALES VOLUME</th>
<th></th>
<th>HOUSEHOLD</th>
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<tbody>
<tr>
<td></td>
<td>2008</td>
<td>2010</td>
<td>Growth Rate</td>
<td>2008</td>
</tr>
<tr>
<td>0 to 0.25-Mile</td>
<td>4,206,615</td>
<td>2,607,625</td>
<td>-0.21267111</td>
<td>5,834</td>
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<tr>
<td>0.25 to 0.50-Mile</td>
<td>2,394,240</td>
<td>2,670,681</td>
<td>0.05615380</td>
<td>7,824</td>
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</table>
Modeling Results (L.A., Las Vegas)

![Graph showing observed and modeled passenger data for Las Vegas MAX system.](image)

<table>
<thead>
<tr>
<th>Time (Year)</th>
<th>2008</th>
<th>2009</th>
<th>2010</th>
</tr>
</thead>
<tbody>
<tr>
<td>Observed (Pax/Day)</td>
<td>7,313</td>
<td>6,846</td>
<td>5,699</td>
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<tr>
<td>Modeled (Pax/Day)</td>
<td>6,742</td>
<td>6,811</td>
<td>6,885</td>
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</tbody>
</table>

![Graph showing observed and modeled passenger data for another system.](image)

<table>
<thead>
<tr>
<th>Time (Year)</th>
<th>2008</th>
<th>2009</th>
<th>2010</th>
</tr>
</thead>
<tbody>
<tr>
<td>Observed (Pax/Day)</td>
<td>17,875</td>
<td>16,372</td>
<td>16,494</td>
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<tr>
<td>Modeled (Pax/Day)</td>
<td>16,276</td>
<td>16,286</td>
<td>16,299</td>
</tr>
</tbody>
</table>
Research Contributions

- GIS Business Analyst data extraction for transportation planning purposes (transit)
- SD model to estimate BRT daily ridership
Questions?

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