ABMs for the Rest of the State

Presented to: Advanced Model Structures Subcommittee
Presented by: Siva Srinivasan (UF) & Abdul Pinjari (USF)

Date: Wednesday, December 5, 2012

---

**Background**

- **NFRPM:** DaySim
- **TBRPM:** DaySim
- **SERPM:** CT-RAMP

**ABM for the Other Areas:** ??
**Background**

**Focus:**

“Rest of the State”

“Non-major-MPOs”

Regions of Florida excluding the areas covered by NERPM, SERPM, TBRPM, and CFRPM

---

**Setting the Stage for Today**

It IS NOT expected that

Smaller regions will use ABMs for their next LRTP update

We will have a “policy statement” to bring to vote to this MTF meeting
**Setting the Stage for Today**

It **IS** expected that

Discussions about a state-wide move to ABM *with emphasis on the “rest of the state”* will be initiated

We will have a “policy statement” to bring to the next MTF meeting

---

**Intent of Presentation**

- Address some questions about ABM from the perspective of the “rest of the state”

- Identify possible next steps for Florida

- Stimulate discussions
**Question:**

Why do I need an advanced model (ABM) if my region does not have to answer the types of complex policy questions like Jacksonville, Tampa, Miami, or Orlando?

**Response:**

ABM leads to Increased Accuracy in Travel-Demand Predictions

Improved treatment of non-home-based trips
**Response:**

Trip-Chaining patterns in “Rest of the State”

<table>
<thead>
<tr>
<th>Stops in Tour</th>
<th>HB Trips in Tour</th>
<th>NHB Trips in Tour</th>
<th>Freq.</th>
<th>Total HB Trips</th>
<th>Total NHB Trips</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>0</td>
<td>4336</td>
<td>8672</td>
<td>0</td>
</tr>
<tr>
<td>2</td>
<td>2</td>
<td>1</td>
<td>1287</td>
<td>2574</td>
<td>1287</td>
</tr>
<tr>
<td>3</td>
<td>2</td>
<td>2</td>
<td>802</td>
<td>1604</td>
<td>1604</td>
</tr>
<tr>
<td>4</td>
<td>2</td>
<td>3</td>
<td>407</td>
<td>814</td>
<td>1221</td>
</tr>
<tr>
<td>5</td>
<td>2</td>
<td>4</td>
<td>230</td>
<td>460</td>
<td>920</td>
</tr>
<tr>
<td>6</td>
<td>2</td>
<td>5</td>
<td>120</td>
<td>240</td>
<td>600</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td></td>
<td></td>
<td>7182</td>
<td>14364</td>
<td>5632</td>
</tr>
</tbody>
</table>

**Response:**

ABMs simulate travel demand person by person in the form of feasible and internally-consistent “travel diary”

<table>
<thead>
<tr>
<th>HH ID</th>
<th>Pers. ID</th>
<th>HH Size</th>
<th># Cars</th>
<th>Income</th>
<th>Gender</th>
<th>Age</th>
<th>Dest.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>50000</td>
<td>M</td>
<td>40</td>
<td></td>
</tr>
</tbody>
</table>

- **HH ID**: Household Identification Number
- **Pers. ID**: Person Identification Number
- **HH Size**: Household Size
- **# Cars**: Number of Cars
- **Income**: Household Income
- **Gender**: Gender
- **Age**: Age
- **Dest.**: Destination

![Map Image]
Response:

Trip-based models

“Aggregate” System Performance Measures

- Number of Trips Generated
- Mode Shares
- Vehicle Miles Traveled (VMT)
- Vehicle Hours Traveled (VHT)

Activity-based models

“Disaggregate” System Performance Measures

- Number of Trips Generated
- Mode Shares
- Vehicle Miles Traveled (VMT)
- Vehicle Hours Traveled (VHT)

By: income levels, age, car ownership levels, time of day, ...

Question:

I do not have the type of detailed land-use data (parcels and micro-zones). So how can I have an ABM?
Response:

Better treatment of NHB trips & parking demand

Reduction of aggregation-bias

Disaggregate simulation

Sensitivity to Transportation System

Evaluation of dynamic & multi-modal policies

Tours as a unit of Analysis

Feasible and consistent demands

Space-Time Constraints

Long-term vs. Short-term Choices

Work location does not change in short-term

Evaluation of land-use policies

Question:

Do I have to learn a whole new software?
ABMs interface with popular Travel-Demand-Forecasting Software

Response:

- PopulationSynthesizer
- Long Term Choices Simulator
- Detailed Population Characteristics
- Simulated Travel Patterns of Each Person in Population
- Internal-Internal Travel Demand of Residents by Mode & Time of Day (“OD Matrix”)
- CUBE
  - External Travel (IE, EI, and EE) Demand
  - Freight Travel Demand
  - Non Resident Travel Demand

Custom code

Network Outputs & Reports

CUBE

Question:

What about the Costs?
Response:

The net “cost” of an ABM model is decreasing

Several working implementations already exists across the country
“Comparable to costs of a four-step model update”

Florida specific

Data: the NHTS 2009 add-on surveys
Possibility of a statewide standard (economies of scale)
Training provided by central office

Question:

How do we move towards using ABMs as standard modeling practice?
Model-by-Model Update

- Replace each of the existing models by a corresponding ABM
  - Build models using local data (travel surveys)
  - Borrow data to estimate parameters
  - Borrow (Transfer) model structure and parameters and Calibrate to NHTS & Other Data

Statewide Standard

- Use NHTS add-on data to build a simple, standard framework and estimate a common set of model parameters to be used by all regions in the rest of the state
  - Small data samples for each specific region but total volume of NHTS data is significant
  - Consistency -> cost, training, software, user-group interactions
  - Can still support region-specific model customizations
  - Starting point for transition into advanced ABM

Summary

The Vision: FSUTMS- ABM

Conceptual Standardization with Implementation Flexibility—The Approach for Future FSUTMS?

<table>
<thead>
<tr>
<th>Conceptual Standardization</th>
<th>Implementation Flexibility</th>
</tr>
</thead>
<tbody>
<tr>
<td>Forecast travel person-by-person (not zone by zone)</td>
<td>Variability in richness of features: Major urban areas deal with</td>
</tr>
<tr>
<td>Consistently model tours/trip chains instead of trips</td>
<td>• finer temporal resolution</td>
</tr>
<tr>
<td>Destination-choice models instead of gravity models</td>
<td>• Greater land use sensitivity</td>
</tr>
<tr>
<td>Predict travel mode for tours as a whole, not for trips</td>
<td>• More population segments</td>
</tr>
<tr>
<td></td>
<td>• Additional travel behavior patterns (such as escort &amp; joint travel)</td>
</tr>
</tbody>
</table>