Dynameq: The Next Generation in Traffic Forecasting and Analysis

I-70 STEIS in Kansas City Case Study

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Presentation Overview

1. Project Background
2. What is Dynameq? Why Did We Use It?
3. Using Dynameq
4. Reasonable and Preferred Alternatives
5. Results and Conclusions
6. Future Possibilities
**Purpose and Need**

- **Improve Safety** - From 2008 to 2012, there were:
  - 2,017 crashes
  - 10 fatal and 28 disabling injuries crashes
  - Majority of the corridor exceeds the statewide average crash rates for urban interstates by more than 100 percent.

<table>
<thead>
<tr>
<th>Section</th>
<th>Section Name</th>
<th>Length</th>
<th>Average 2008-2012 Crash Rate Versus Statewide Average Crash Rate (109.61)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Eastbound</td>
</tr>
<tr>
<td>Section 1</td>
<td>Paseo Interchange</td>
<td>0.87</td>
<td>101%</td>
</tr>
<tr>
<td>Section 2</td>
<td>Benton Curve</td>
<td>1.20</td>
<td>168%</td>
</tr>
<tr>
<td>Section 3</td>
<td>23rd Street Interchange</td>
<td>0.67</td>
<td>88%</td>
</tr>
<tr>
<td>Section 4</td>
<td>Jackson Curve</td>
<td>0.90</td>
<td>203%</td>
</tr>
<tr>
<td>Section 5</td>
<td>Van Brunt</td>
<td>0.73</td>
<td>174%</td>
</tr>
<tr>
<td>Section 6</td>
<td>US-40</td>
<td>0.59</td>
<td>146%</td>
</tr>
<tr>
<td>Section 7</td>
<td>Manchester</td>
<td>0.57</td>
<td>208%</td>
</tr>
<tr>
<td>Section 8</td>
<td>I-435</td>
<td>0.96</td>
<td>247%</td>
</tr>
<tr>
<td>Section 9</td>
<td>Blue Ridge Cutoff</td>
<td>1.28</td>
<td>144%</td>
</tr>
</tbody>
</table>
• **Reduce Congestion**
  
  - Congestion is not directly linked to traffic volumes (current AADT between 75,000 and 115,000)
  - Congestion occurs at spot locations where there are substandard merge, diverge, and weave areas.
Purpose and Need

- **Restore and Maintain Existing Infrastructure**
  - I-70 is more than 50 years old
  - Deteriorating pavement and bridges
  - Geometric issues (Benton and Jackson Curves)
  - Closely spaced interchanges (15 partial or full interchanges in 6.8 miles)
  - Ramp issues (short and/or steep on- and off-ramps)
Purpose and Need

- **Improve Accessibility**
  - There are 19 street crossings and 2 pedestrian bridges to enable non-motorized access across I-70
  - To assist non-motorized travel across I-70, there are currently 9 bus routes that cross I-70
  - There are 4 bus routes that travel on I-70
Purpose and Need

- **Improve Goods Movement**
  - Trucks are 11% of the daily volume
  - I-70 provides access to several major truck facilities along the corridor and region.
What Is Dynameq and Why Use It?

- Dynamic Traffic Assignment (DTA)
- Benefits of Macro- and Micro-Simulation
- Medium-sized network
- Time Component
- Integration with MARC Model
The Region
The Model Area
The Subarea
The Subarea
Steps to Get Network into Dynameq

1. EMME to Dynameq
2. Dynameq to Synchro
3. Edit Synchro Network
4. Import into Dynameq
Updating Geometry in Synchro

- Lanes and Sharing
- Storage Length
- Storage Lanes
- Right Turn Channelized
- Curb Radius
- Add Lanes
- Right Turn on Red?
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EMME to Dynameq → Dynameq to Synchro → Edit Synchro Network → Import into Dynameq
Steps Taken once our network was in Dynameq

1. Address Network Warnings
2. Add Traffic Counts
3. Calibrate AM/PM Models to Achieve Acceptable Threshold
4. Build Alternative Networks
5. Calibrate Alternative Networks
6. Create Subarea
7. Export Results
8. Create Graphics
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- Address Network Warnings
- Add Traffic Counts and Speeds
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Potential Improvements

**Short-Term Action Items**
- Mowing
- Maintenance
- Bridge Replacement

**Support Lanes and Roads**
- Auxiliary Lanes
- Collector Distributor Lanes
- Frontage/Parallel Roads
- Reversible Lanes

**Interchange Options**
- Consolidation
- Modification
- Elimination

**Rebuild I-70 to last 30 years**

**Horizontal Curves**

**Low Clearance Bridge (14’3”)**

**Short Weave Areas**

**Add Park and Ride lot**

**Bus on Shoulder**

**Improve Bike and Pedestrian Crossings**

**Flexible Work Hours**

**Ramp Metering**

**Short Merge/Diverge Areas**
Second Tier Alternatives

- Three Second Tier Alternatives
  - No-Build Alternative
  - Geometric Improvements Alternative
  - Interchange Consolidations Alternative

- Second Tier Screening
  - Purpose and Need
  - Social and Natural Environmental Issues
  - Engineering Issues
  - Public Comment
Preferred Alternative

I-70 Second Tier Environmental Impact Statement
Preferred Alternative (draft - subject to change)
The Paseo to Van Brunt Blvd.

Improving safety and efficiency
The Missouri Department of Transportation (MoDOT) has been conducting the I-70 Second Tier Environmental Impact Statement (EIS) since late 2011. The goal is to develop recommendations for approximately seven miles of Interstate 70 between The Paseo and Blue Ridge Interchanges.

The EIS recommendations - the Preferred Alternative - are designed to improve the highway’s safety and efficiency while minimizing negative impacts to the community’s current and future vitality and economic activity. The Preferred Alternative:
- Makes improvements to interstate ramps, as well as in areas where drivers merge with or maneuver through other traffic, resulting in safer traffic operations;
- Consolidates one interchange and two ramps to increase safety and minimize impacts as requested by the community in extensive ongoing community dialog;
- Rebuilds and/or rehabilitates I-70 pavement and bridges, along with improvements to the Beaton and Jackson Curves, over time;
- Includes improving bicycle and pedestrian access across I-70; and
- Calls for MoDOT to continue transit and Intelligent Transportation System coordination in the study area through Operation Green Light, Smart Move, Regional Transit Vision and the Jackson County Commuter Corridors Alternatives Analysis.

Other corridor improvements are underway as part of a related but independently funded project. Construction will begin in early 2014 to replace the existing Manchester Bridge and add auxiliary lanes for safer, more efficient traffic flow. Future I-70/I-435 interchange improvements will be constructed in phase(s) based on funding availability. This interchange is currently a scoping project.

Legend
- Existing I-70 - replace or rehabilitate pavement over time as other improvements are implemented and traffic and budget warrant.
- Mainline improvements - improve tight curves to improve safety and increase travel speeds; lengthen acceleration lanes or eliminate lane drops.
- Ramp/interchange improvements - Most improvements involve lengthening ramps whenever possible and updating their configuration to help make entering and exiting the highway safer.
- New auxiliary lanes - Additional lanes allow more time and space for cars to safely enter and exit the highway.
- Bridges - Replace or rehabilitate overtime as other improvements are implemented and traffic and budget warrant.
- Closures/lane reductions - Some roads and access/exit points will be closed or consolidated to improve safety and traffic operations.
- Local connections - Maintain local movements with new street connections.
- New cul-de-sacs - Dead-end streets will help accommodate improvements and increase safety.

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Preferred Alternative

I-70 Second Tier Environmental Impact Statement
Preferred Alternative (draft - subject to change)

Van Brunt Blvd. to Blue Ridge Cutoff

The I-70 improvement dialog
MoDOT has worked closely with the local community and other highway users to develop potential I-70 solutions. Extensive stakeholder dialog has taken place with the study's 14-member Community Advisory Group and other stakeholders through face-to-face meetings, community group meetings, listening posts and electronic outreach. Area residents, business owners and travelers have been provided multiple opportunities to ask questions about or to comment on the EIS. They can:
- Find out more at www.metroi70.com
- Learn more from the study's Community Advisory Group members who represent Kansas City's 3rd Council District, Cities of Kansas City, Independence, and Raytown; Jackson County; Mid-America Regional Council; Downtown Council of Kansas City; Greater Kansas City Chamber of Commerce; Hispanic Chamber of Commerce of Greater Kansas City; Kansas City Industrial Council; Jackson County Sports Complex Authority; and the Owner-Operator Independent Drivers Association;
- Meet with a member of MoDOT's Community Connections Team (CCT) to discuss issues and concerns. The CCT is comprised of customer relations, environmental analysis and engineering specialists;
- Contact MoDOT Area Engineer Matt Killion at Matthew.Killian@modot.mo.gov or 816-622-0500 or MoDOT Planning Manager Randy Johnson at Randy.Johnson@modot.mo.gov or 816-687-2265.

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Features We Liked

- Network Warnings
- Scatterplot for R-Square
- Time Slide Bar
- Graphical Capabilities Make Calibration Easy
- DTA
  - Creating user defined attributes ➔ Displaying them in simulation results
  - Filters
  - Creating Select Links
- Creating Subareas ➔ Exporting results
Features We Liked

- Network Warnings
- Scatterplot for R-Square
- Time Slide Bar
- **Graphical Capabilities Make Calibration Easy**
- **DTA**
  - Creating user defined attributes → Displaying them in simulation results
  - Filters
  - Creating Select Links
- Creating Subareas → Exporting results
Features We Liked

- Network Warnings When Loading a Project
- Scatterplot for R-Square
- Time Slide Bar
- Graphical Capabilities Make Calibration Easy
- DTA
  - Creating user defined attributes \(\rightarrow\) Displaying them in simulation results
  - Filters
  - Creating Select Links
- Creating Subareas \(\rightarrow\) Exporting results
## Deliverable

<table>
<thead>
<tr>
<th>AM Peak / Westbound</th>
<th>Existing (2012)</th>
<th>No-Build (2040)</th>
<th>Improve Geometrics (2040)</th>
<th>Interchange Consolidation (2040)</th>
<th>Preferred (2040)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vehicle Miles Traveled</td>
<td>442,887.89</td>
<td>549,038.60</td>
<td>554,409.45</td>
<td>554,373.83</td>
<td>555,511.82</td>
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<td>Vehicle Hours Traveled</td>
<td>10,650.77</td>
<td>15,623.16</td>
<td>15,834.69</td>
<td>15,849.85</td>
<td>15,025.01</td>
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<td>Vehicle Hours of Delay</td>
<td>1,788.45</td>
<td>4,342.64</td>
<td>4,477.04</td>
<td>4,375.54</td>
<td>3,732.77</td>
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<tr>
<td>Average Speed (MPH)</td>
<td>41.58</td>
<td>35.14</td>
<td>35.01</td>
<td>34.98</td>
<td>36.97</td>
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<table>
<thead>
<tr>
<th>PM Peak / Eastbound</th>
<th>Vehicle Miles Traveled</th>
<th>Vehicle Hours Traveled</th>
<th>Vehicle Hours of Delay</th>
<th>Average Speed (MPH)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Existing (2012)</td>
<td>482,803.52</td>
<td>12,113.33</td>
<td>2,187.52</td>
<td>39.86</td>
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<tr>
<td>No-Build (2040)</td>
<td>615,721.30</td>
<td>17,878.10</td>
<td>5,078.87</td>
<td>34.44</td>
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<tr>
<td>Improve Geometrics (2040)</td>
<td>616,211.00</td>
<td>18,057.09</td>
<td>5,258.78</td>
<td>34.13</td>
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<tr>
<td>Interchange Consolidation (2040)</td>
<td>621,499.91</td>
<td>17,912.19</td>
<td>4,900.66</td>
<td>34.70</td>
</tr>
<tr>
<td>Preferred (2040)</td>
<td>619,783.86</td>
<td>17,937.81</td>
<td>5,047.88</td>
<td>34.55</td>
</tr>
</tbody>
</table>
Conclusions about Dynameq

- **Strengths of the program**
  - Graphics
  - Time Dimension

- **Challenges**
  - Editing network
  - Detailed operations (e.g. merging/weaving)
  - Subarea extraction could be improved

- **Opportunities**
  - Maintenance of Traffic Analysis
  - Expand model to regional level?
Future Steps
Thank You. Questions?

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