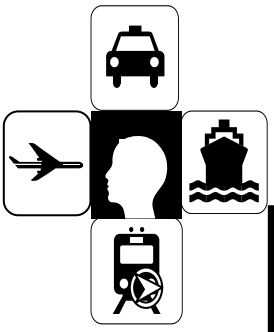

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Tech Brief

Development of Weekend Travel Demand and Mode Choice Models

FHWA-NJ-2009-013 June 2009

The Problem?

Travel demand models are widely used for forecasting and analyzing policies for automobile and transit travel. However, these models are typically developed for average weekday travel when regular activities are routine. The weekday models focus primarily on peak period travel, which are dominated with work and school trips. Given that weekend travel is largely generated for discretionary activities and is significantly affected by seasonal variation and special events, it is not surprising that weekday models are not adequate to forecast weekend travel.

The Response !!!

In our effort to develop a pilot weekend travel demand forecast and mode choice model for New Jersey, the research team had proposed a holistic approach that balances state of art research and practical modeling applications for multiple agencies. The pilot model, produced via enumeration applications, not only incorporated up-to-date understanding of dynamics of weekend travel behavior but also obtained consensus from various agencies in New Jersey so it will be implemented.

Research Objectives

The purpose of this research is to specify a model that can be used to forecast weekend travel that incorporates the following processes: trip generation by trip type, time of day, origin-destination pattern, and mode choice. To derive the ultimate product of this project, the research team has undertaken the following:

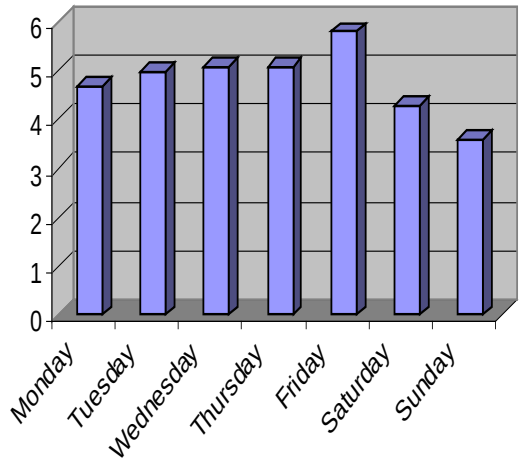
1. Examined the state of the art in model development for non-work, off-peak, and weekend travel;
2. Evaluated alternative multi-modal modeling approaches, explicitly considering the impacts of various factors such as congestion on mode shifts;
3. Reviewed available models and travel survey data at NJDOT, NJ TRANSIT and the local MPO's;
4. Identified data deficiencies and statistical validity of alternative approaches;
5. Developed requirements and standards for incorporating changes to accommodate weekend travel into existing model frameworks;
6. Recommended a course for the development of multi-modal weekend travel demand forecasting models suited to the needs of New Jersey;
7. Calibrated a pilot model that demonstrates the methodology and procedures to develop weekend travel demand forecast and mode choice model for New Jersey.

Project Tasks

- Literature Review
- Inventory of New Jersey Models
- Survey of State of Art Practices
- Develop Modeling Specifications
- Collect Transit Corridor Data
- Estimate Pilot Model
- Prepare a Final Report.

Survey Results

Limited studies on weekend travel have painted very different pictures on the US and abroad but generally agree that the most trips occur on Friday and the least on Sunday as shown in the following Figure.

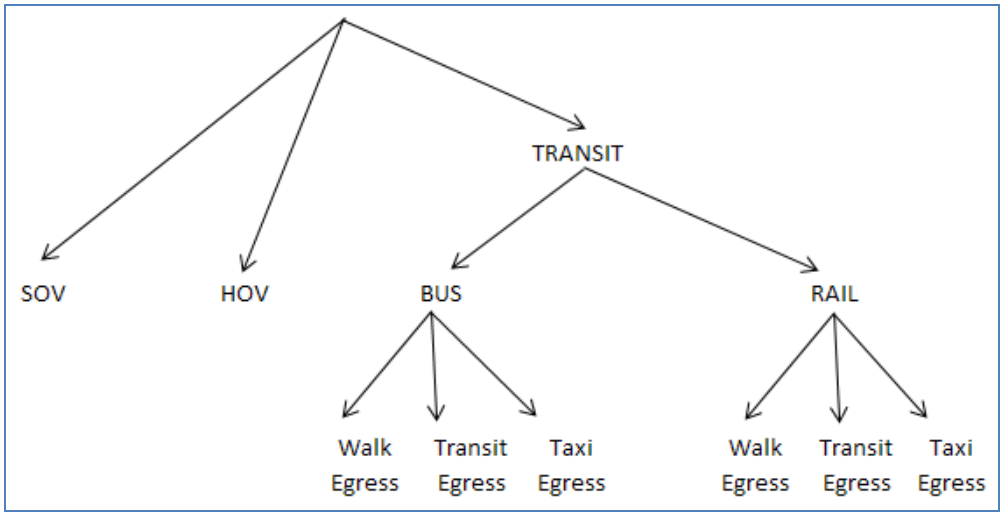


In New Jersey, there are at least six existing travel demand models that are focused on or related to the Garden State as shown in the following table. A brief review of each model serve as the basis for developing a weekend travel demand forecast and mode choice model for New Jersey. Due to diversified travel patterns, modal preferences, and capabilities of each jurisdiction, the models in New Jersey vary by size, complexity, and structure. Their potential for incorporating the weekend module varies also.

Agency	Platform	WEEKEND MODULE	Weekend Data
NJTPA	TRANPLAN	No	Small Amount
SJTPO	Cube/TP+	Yes	Some
DVRPC	TRANPLAN w/ Evans Algorithm	No	Small Amount
NYMTC	TRANSCAD	No	Small Amount
NJ Transit	TP+	No	Some
NJ DOT	Cube	No	None

The Pilot Weekend Model

The calibrated model has a Nested Logit (NL) structure, with transit mode options grouped together in a bi-level nest as shown in the following figure. This structure was adopted based as both logical and consistent with the mode choice model of the weekday North Jersey Transit Demand Forecasting Model (NJTDFM). Eight mode choices were considered in the pilot model.



The explanatory variables considered in the model for analysis are Level-of-Service variables, personal characteristics, household variables, travel characteristics and others.

The model is fully segmented by trip purpose, work related vs. recreation, since significant behavioral differences are found. The observed data shows a more HOVs and fewer SOVs are used for recreation/others as compared to work/person business trips. The model is partially segmented by car availability. It directly affects the mode choices through availability rules and accounts for captive transit users. Party size variable affects the impact of auto related costs and taxi fare directly by distributing the costs over all persons in the group. Also, it affects auto mode availability – allowing only HOV for groups and SOV for alone travelers.

After calibration and validation, the research team has carried out a number of sensitivity tests using the final calibrated model and reported here. These tests include the types of forecasting applications the model can address, including policy analysis related to changes in level-of-service such as improvement in rail travel time, reduction in transit fare, doubling of transit frequency on weekend, higher auto tolls and increase in highway congestion. Demographic changes at the origin level can also be analyzed by this model.

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A final report is available online at
http://www.state.nj.us/transportation/refdata/research.html

If you would like a copy of the full report, please FAX the NJDOT, Division of Research and Technology, Technology Transfer Group at (609) 530-3722 or send an e-mail to Research.Division@dot.state.nj.us and ask for:

Report No: FHWA-NJ-2009-013

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