Scan of best practices in travel demand forecasting: TPB staff comments on Cambridge Systematics' draft report: "Fiscal Year 2010 Task Reports"

Presented to the Travel Forecasting Subcommittee
of the TPB Technical Committee

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Acknowledgements

- Review of the Cambridge Systematics draft report by the following staff:
  - Ron Kirby, Ron Milone, Mike Clifford, Jinchul Park, Dusan Vuksan

Background

- In 2005, TPB staff made the decision to hire a consultant, on a task-order basis, to provide an on-going review of the travel demand forecasting process and to perform a scan of the best modeling practice in the U.S.
- First contract was with Vanasse Hangen Brustlin, Inc. (VHB) in FY 2006. The contract was renewable for up to three years and VHB was the contractor for all three years (FY 2006, 2007, and 2008).
- In 2008, the contract was re-bid and the winning contractor was Cambridge Systematics, Inc. (CS).
- CS has performed the task-order work for two fiscal years (2009 and 2010) and will be continuing on for FY 2011

Background

- Overall, we were quite impressed with the work done by CS in researching, preparing, and writing this draft FY 2010 report.
  - It gives us useful information and much to consider in formulating future models development program activities.

Topics covered in CS' draft FY-10 report

- Further Investigation of Convergence in User Equilibrium Traffic Assignment and Speed Feedback (Task 7)
- Potential Short-Term Model Enhancements
  - Trip Purposes and Special Generators (Task 8)
  - Time of Day Model, Queue Delay Function, and Two-Step Assignment (Task 9)
  - Transit-Related Enhancements (Task 10)

Deliverables from CS and comment period

- May 21 TFS meeting: CS staff presented the major findings from the first three task orders (#7-9)
- Late June: Four draft reports/memos, one for each task order, were e-mailed to TPB staff
- In mid July, CS repackaged the four draft reports/memo into one draft report dated June 30, 2010
- July 23 TFS meeting:
  - CS staff presented the major findings from task order #10
  - We shared the CS FY 2010 draft report with the TFS, announcing that it had been uploaded on the TFS web page
  - 30-days review and comment period
- As of early Sept., TPB staff had received no external comments on the draft report

Change in focus

- Originally
  - TPB staff preparing one memo with two parts
    - Comments on the CS draft report to bring it out of draft
    - TPB staff thoughts on which of the CS recommendations to implement, including a proposed timeline for implementation
      - e.g., which enhancements might go into the new Version 2.3 travel model on the 3,722-TAZ area system and which might be implemented in later models
  - Some of this information was presented in preliminary form at the last TFS meeting
  - Some was also included in a recent TPB report (*FY-2010 Development Program for TPB Travel Forecasting Models: DRAFT,* TPB, June 30, 2010).

Change in focus

- Now, at the suggestion of the DTP director
  - TPB staff will prepare two separate memos
    1. Comments on the CS draft report to bring it out of draft
    2. TPB staff thoughts on which of the CS recommendations to implement, including a proposed timeline for implementation
  - First memo is ready (this presentation) and has been shared with CS
  - Second memo is under development

TPB staff comments

- Comment 1: Please try to remove the use of the terms “advanced” and “traditional” when referring to travel demand modeling techniques.
  - Instead, please use terms that describe the methodology
  - Alternatively, if theses terms are used, please define them

TPB staff comments

- Comment 2: Consumer perspective: As a "consumer" of travel forecasting methods, TPB is interested in evaluating alternative modeling techniques using performance measures such as:
  - Validation of forecasts against baseline data and reasonableness of forecasts;
  - Availability and cost of data required for forecasting methods;
  - Run times and computing complexity, level of convergence, and consistency of results;
  - Sensitivity to key policy concerns and questions, e.g., motor vehicle emissions;
  - Reliability of methods and software; Are the methods sound? Has the software been fully tested and proven?
  - Focus on what is *important* to producing the forecasts required, and what is *cost effective*, in terms of performance improvement per dollar of expenditure

TPB staff comments

- Comment 5: Citilabs is one of the few vendors not offering a multithreaded traffic assignment. Why not?
- Comment 6: There are two procedures in the TPB travel model that have sometimes been referred to as the "two-step assignment."
  - To help remove ambiguity, we would like CS to reword the report so that it draws the distinction between these two procedures (defined on the next two slides):
    - "two-step assignment"
    - "multi-run assignment"

Two-step assignment

Goal: To improve the assignment of HOV/HOT traffic on I-495 & I-395 in Virginia

Prior to two-step assignment

	# UE Iterations	Period	Trip Markets Assigned
Assignment 1	60	AM	1 SOV 2 HOV 2-Occ. 3 HOV 3+-Occ. 4 Trucks 5 Airport Pax
Assignment 2	60	PM	1 SOV 2 HOV 2-Occ. 3 HOV 3+-Occ. 4 Trucks 5 Airport Pax
Assignment 3	60	Off-Peak	1 SOV 2 HOV 2-Occ. 3 HOV 3+-Occ. 4 Trucks 5 Airport Pax

Two-step assignment

	# UE Iterations	Period	Trip Markets Assigned
Assignment 1	60	AM	1 SOV 2 HOV 2-Occ. 3 Trucks 4 Airport Pax
Assignment 2	60	AM	1 HOV 3+-Occ.
Assignment 3	60	PM	1 SOV 2 HOV 2-Occ. 3 Trucks 4 Airport Pax
Assignment 4	60	PM	1 HOV 3+-Occ.
Assignment 5	60	Off-Peak	1 SOV 2 HOV 2-Occ. 3 HOV 3+-Occ. 4 Trucks 5 Airport Pax

Multi-run assignment

- Model is run twice to address HOV policy and capture the impacts of HOT lanes
- Process developed to accommodate VDOT's policy that HOT facilities will not degrade the operations of HOV users
  1. Run 1 ("base run"): Captures the travel time for unimpeded flow of HOV traffic on HOT lanes consistent with VDOT's stated policy
  2. Run 2 ("conformity run" or "final run"): Substitutes the HOV skims from the previous run for the HOV skims that would otherwise be obtained by simply skimming the networks with HOT lanes in operation
- Only the HOV skims are taken from the "base run"
  - Skims for all other modes are taken from the "conformity run"
- See comment #10

TPB staff comments

- Comment 7: On page 3-7, CS states, "The volume delay function used in the Version 2.2 TPB model incorporates a speed floor of 2 mph."
  - Please restate to indicate that there are a series of speed floors
    - About 1 mph for freeways
    - About 1-2 mph for arterials
    - About 1-2 mph for collectors
- Comment 8: CS recommends TPB staff consider developing a newly calibrated set of link-based VDFs that reflect the breakdown in traffic at higher volumes
  - Continue use of an expanded and/or re-calibrated conical function
  - Switch to an Akçelik curve
  - Possibly employ different functional forms of VDFs on different facility types (e.g., conical functions for freeway versus Akcelik functions for surface streets)
- TPB staff has the following questions:
  - Does the Akcelik function require new network coding requirements?
  - What do we calibrate to?

TPB staff comments

- Comment 9: CS states, "In implementing these toll adjustments, we further recommend that the toll rate be set based on link capacity rather than speed."
  - The current TPB procedure uses V/C ratio (not speed)
    - See: Jinchul Park to Files, "HOT Lane Modeling Process of MWCOG/TPB (Draft)," Memorandum, April 26, 2010.

TPB staff comments

- Comment 10: We would like to test running the travel model without the multi-run traffic assignment before we commit to removing it. Can we get copies of the model setups that were used for the tests?
- Comment 11: CS states, "In comparison, the auto operating cost is assumed to decline in real dollars (1994) for the Version 2.2 TPB model, varying from 9.1 cents per mile in 1994 to 8.3 cents per mile in 2005 and 7.8 cents per mile in 2030..."
  - Although this was true in the past, this practice was changed in more recent work with the Version 2.2 Travel Model.
  - The current practice is to assume that auto operating costs remain constant over time, at a value of 8.2 cents per mile in 1994 dollars.
  - This change in assumptions to the Version 2.2 model was done to improve the model's forecasting performance.
  - CS could not have known about this change in assumption, since it has not yet been formally documented.

TPB staff comments

- Comment 12: TPB is interested in learning who is using Cube PT (Public Transport) and what, if any, are the hindrances to using this new package. Perhaps this investigation could be part of a future task order.
- Comment 13: CS states that, "Out of the 25 regional models reviewed, approximately half of the mode choice models were estimated, and the remaining half took either the assertion approach or the hybrid approach."
  - Yet, in the description of the "estimation approach," only one example is given of a nested-logit mode choice model (MTC), and that work was done 13 years ago. The other two examples in the "estimation approach" section – Portland Metro and Boston CTPP – used multinomial logit. Boston CTPS used data from 1991 (18 years old).

Conclusion

- CS has delivered its draft FY 2010 report, covering task orders 7-10
- TPB staff is very impressed with the work that has gone into their research and is still considering the recommendations in the CS report
- TPB staff identified a small number of issues that we would like addressed in the final report (this presentation)
- A memo should be forthcoming in the near future that will include TPB staff thoughts on which of the CS recommendations to implement and when