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*Papers presented at the Transportation Research Board (TRB)  
94th Annual Meeting, Washington, D.C., January 11–15, 2015*

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## *Editorial*

Special Issue: Dynamics of Travel Behaviour

Papers presented at the Transportation Research Board (TRB) 94th Annual Meeting, Washington, D.C., January 11-15, 2015.

Taha H. Rashidi and Carlos M. Lima Azevedo

Travel behaviour has been under the spotlight of transportation research for almost 50 years. The focus on disaggregate data to model travel demand, initially with trip-based and tour-based models in the early 70s and 80s, quickly gave birth to a growing research stream on activity-based models. These models integrate travel related decisions of people for at least one day and, although the exact construction of the travel pattern may vary, most frameworks include the representation of the number, purposes (activities), timing, location and travel mode of traveller's tours and stops. Activity-based models were proposed to increase the accuracy of alternative travel behaviour models, with higher spatial and temporal resolutions and a sounder and more realistic representation of key individual behaviours affecting travel. Their effectiveness prevails the alternative travel demand models when used for policy appraisal. Rule-based and utility-based frameworks have now reached the state-of-the-art and practice of activity-based models with several deployment efforts reported by metropolitan planning agencies, players in the transportation consultancy and software development fields. These efforts showed some of the key benefits of activity-based models, but also revealed more evidence for further research efforts by the research community. Further insights on the integration of activity-based models with dynamic network assignment models, on day-to-day dynamics, on non-observed or overlapping choice alternatives or decision dimensions, on more advanced behavioural formulations, such as the inclusion of social or household interactions, and on the development of computationally efficient deployments have caught the attention of the research community. This special issue presents the most recent achievements in some of these emerging research topics, including:

- How can social media data be used in the characterization of individual activities?
- What methods should be used to infer and process large datasets needed for estimation of activity-based models?
- How do different decision variables affect day-to-day changes in multiple choice dimensions?

- How to allow for different individual behavioural attitudes in the formulation of activity-based models?
- Are current dynamic network assignment and equilibrium models compatible with activity-based model formulations?
- How to efficiently model the complex problem of individual activity scheduling given all other choice dimensions?

Similarly to previous years, this Special Issue materializes the abiding commitment between Transportation and two Transportation Research Board Standing Committees (Travel Behaviour and Values and Demand Forecasting) in disseminating leading research. This year's Special Issue presents six outstanding papers that were originally presented at the 2016 Transportation Research Board Annual Meeting on the topic of 'Dynamics of Travel Behaviour'. All six papers focus on sound and innovative methodologies in the field of transportation demand and behaviour modelling with key contributions to the state-of-the-art and practice.

The first paper titled as "Activity Space Estimation with Longitudinal Observations of Social Media Data" explores the capacity of social media data, Twitter data, in extracting travel demand related information. This study finds meaningful differences between weekend and weekday location-based activity patterns. Using a latent class analysis, various space, anchoring and growth trajectories for activity location are found. This study concludes with identifying Twitter data to be a valuable complementary source of information for activity-based modelling and simulation.

The second paper titled as "Analysis of Travel Activity Determinants using Robust Statistics" presents a robust principal component analysis (PCA) to determine variables explaining the variability in travel characteristics. It is also discussed in detail how outliers can significantly affect the results of travel behaviour analysis of classical PCA. The study elaborates how the variability of the data is affected by travel impedance factors, such as time and cost, as well as travel constraints such as party composition. Surprisingly, the timing of activity was not found to be an important determinant in the used data of the region of Ghent in Belgium.

The trade-off between conducting in-home and out-of-home activities is studied in the third paper titled as "Examining the Effects of Out-of-Home and In-Home Constraints on Leisure Activity Participation in Different Seasons of the Year". Analyzing a unique data for multi-period travel diaries of 56 days for 67 individuals in Stockholm, Sweden, a significance role is identified for out-of-home work schedules to determine leisure activity participation decisions. Another interesting finding of the work pertains to the impact of routine behavior on leisure

activity decisions. Having a relatively small sample, the main conclusion of the work is to expand the capacity of the panel data to develop more comprehensive understanding about the interaction between in-home and out-of-home activities.

Advancing the state-of-the-art of activity-scheduling with a focus on activity conflict resolution is the topic of another paper in this Special Issue titled as “Implementation of Scheduling Conflict Resolution Model in ADAPTS Activity-Based Model Using Linear Programming Approach”. A rule-based methods is discussed in this study to replace the existing scheduler of ADAPTS which is shown to outperform the original scheduler by 2.8%. The proposed scheduler benefits from a non-linear optimizer minimizing the amount of changes in start times and durations of involved activities in the conflict situation.

The fifth paper titled as “Dynamic Network Equilibrium for Daily Activity-Trip Chains of Heterogeneous Travelers: Application to Large-Scale Networks” proposes a simulation-based dynamic network equilibrium model that considers individual activity schedules of travellers and the spatial and temporal dependency of trip chains. Such dependencies are typically not considered in traditional trip-based dynamic traffic assignment models. The authors also propose a solution algorithm that maintains computational tractability for large scale networks and successfully test it for the network of the Chicago area.

The last paper of this issue, “A reference-dependent user equilibrium model for activity-travel scheduling”, presents a user equilibrium model for scheduling of activities and trips with multiple user-classes. The users are modelled as being reference-dependent in their decision-making, which is an extension to the existing wide-spread model of utility maximization. A time-dependent supernetwork representation is adopted to simultaneously model the choices of activity location, activity sequence, activity duration, and mode. A simple test-bed model for the combined departure-time and mode choices illustrates the proposed framework, showing that reference points and loss aversion attitudes have significant effects on these choices.

### ***Concluding remarks***

This set of selected papers presents the most recent advancements in some key research trends in the formulation, estimation and application of activity-based models, namely: the use of social media and large data sets, the study of day-to-day dynamics, modelling heterogenous attitudes for activity participation and scheduling. These six papers also point to some valuable trends and ideas that demand further examination. We hope this Special Issue would stimulate these and other lines of research within activity-based models and the ‘Dynamics of Travel Behavior’.

### ***Guest Editors short bio***

Taha Rashidi is a Senior Lecturer of Transportation Engineering in the School of Civil and Environmental Engineering at University of New South Wales (UNSW), Australia. His main research interests include travel demand and land use modelling. Integration of activity-based models with land use modelling and dynamic traffic assignment are his most recent research areas for each of which he been awarded grants by the Australian Research Council and the Faculty of Engineering at UNSW.

Carlos Lima Azevedo is a Research Scientist at the Intelligent Transportation Systems Laboratory and the Executive Director of the Transportation Education Committee at the Massachusetts Institute of Technology (MIT), Cambridge. His research interests involves transportation simulation, behavior modeling, smart mobility, Intelligent Transportation Systems and road safety analysis. The integrated simulation of travel behaviour dynamics and transportation system performance in the presence of new smart mobility solutions is one of his active field of research.