# SUMMARY OF WORKSHOP THREE: MICROSIMULATION IN ACTIVITY ANALYSIS

**BOB SICKO**
Puget Sound Regional Council

**HANI MAHMASSANI**
University of Texas at Austin

The Activity Based Travel Forecasting Conference was designed to allow practitioners, researchers and the academic community to discuss and formulate a general consensus on the following three objectives.

1. What applications are ready for use, what are they and what is needed to make them functional in the planning community.

2. Define the application areas not readily available, research require to develop functional models, and determine how to move them into practice

3. How to disseminate the application areas, encourage use of new methods, provide adequate training and continue research.

**Micro-simulation:**

The micro-simulation workgroup participants represented a diverse mix of public and private practitioners and the academic/research community. As the workgroup session began to unfold, it was obvious that many of the practitioners in the group had very limited experience in using microsimulation techniques or tools in their daily planning activities. Generally, most were aware of some type of *network* micro-simulation application, but few had experience using more complex land use and transportation demand simulation models. The academic and research participants presented to the group a review of the current research activities and potentially viable techniques available for implementation.

As discussion continued, it was further evident that many did not adequately understand the types of inputs required for micro-simulation models nor the type of analytical techniques required in interpreting the output of the models. In fact, during a somewhat intense exchange of confusion, it was pointed out, that as with any modeling (sequential or micro-simulation), one must still think about and analyze the output.

It was concluded from the discussion that traditional analytical tools would not be enough or even adequate to analyze the new databases created within the micro-simulation modeling process and new techniques would have to be taught to practitioners. Also emerging from the discussion was the

awareness that as new researchers and practitioners enter into the field of transportation and land use planning, they may in fact be required to learn two sets of tools to use in real world applications.

**Workshop Summary**

Based on the objectives of the Conference and the discussions within the workgroup, it was agreed that the summary of the work group sessions focus on the following four areas:

1. Applications: What tools are currently available for microsimulation?

2. Obstacles: What stands in the way of implementing the tools?

3. Mechanisms: How can the planning community incorporate the new techniques into their current planning paradigms?

4. Research: What are the application issues and policy implications, what type of models and processes are needed, and what would the methodological framework of the new models be?

**Current Applications**

Discussions focused on what applications have been used or are currently being tested in real world cases.

- A few of the larger Metropolitan Planning Organizations have used the "STEP" software to carry out household-level "micro-simulation" of travel, in Boise, Idaho, a Tour Base Model has been developed, and there has been some work using the disaggregation of traditional production and attractions matrices.

- The Los Alamos effort and others have demonstrated the feasibility of the micro-simulation of population. Employment location/simulation modeling has not been addressed adequately.

- Researchers and private practitioners have used many of the network simulation models, those mention included Dynasmart, and Integration. Neither simulation package has multi-modal capabilities.

- The dynamic micro-simulator Activity-Mobility Simulator (AMOS) is being tested as a prototype for analyzing Travel Demand Management (TDM) policies in the Washington D.C. area.

- Also discussed was the new data technology changes and how they fit into the scheme of collecting data. The electronic directory of land use activity (firm location) and its potential tie-in with spatial data software (GIS) were mentioned.

## Obstacles

The workgroup next focused on what were the key obstacles in preventing a smooth transition to using micro-simulation tools in the planning practice.

- Change. Institutional fear and/or the lack of in-house technical expertise were considered the primary obstacles in incorporating new techniques in the current planning paradigm.

- Level of training and (re-) education needed for new technologies and methodologies initially are staggering. With no clear direction established, it is very difficult to invest monies and staff time at the current time.

- Distinguishing how the new techniques fit with current modeling methodology and how does one compare them was a key point brought up by the workgroup. Concern was raised on how does one directly compare outputs from uniquely different approaches. Will it be an apples to apples comparison or will we need to be addressing similar questions with different approaches.

- Developing as a theme for the Conference was a "Show Me that it really works mentality". Though a lot of theoretical and some hands on methods were described, no tangible tools or methodologies could be agreed upon. Very few practitioners envisioned changing their current planning processes in the near future.

## MECHANISMS

The workgroup next examined the potential mechanisms that would be required to begin the process of incorporating activity-based micro-simulation in today's planning environment. Though not inclusive the following were the top five suggestions developed by the workgroup.

- First and foremost it is essential that we need to take an *incremental approach* in implementing the potential new planning tools. This incremental approach should incorporate both the transition to new analytical tools and the training required to use them.

- *Good* documentation of new techniques, showing when and where they are applicable in the planning process is imperative. One needs to understand the benefits and the short-comings of using the new tools over current tools and practices. Developing interactive tutorials or class room courses were a few of the examples discussed by the group.

- If practitioners are to change the tools and processes used to meet Federal (and State) requirements, acknowledgment of the difficulties inherent in the transitioning process must be developed. A Federal or State decree on the issue must be established as well as a concerted effort to provide guidance to the many players in the planning and research professions.

- The regulatory environment *must* be supportive of the changes required in transitioning to new methodologies. In particular, concern over interpretation of air quality findings between two different modeling methodologies and the implication on conformity, Federal and State environmental regulations, and potentially, traffic mitigation issues.

- It was also suggested that the technical community ride the wave of emerging technologies to obtain key data required for new modeling paradigms and validation of outputs. This includes the myriad of Intelligent Transportation System (ITS) components (e.g., Automated Traffic Information System (ATIS), Automatic Vehicle Identifier and Location (AVI/AVL), etc.).

## RESEARCH NEEDS

The last area of discussion by the workgroup was research required to assist in the implementation of micro-simulation into the planning arena. Many ideas were presented and they have been categorized into three parts, application and policy issues, models and process, and methodological framework. To adequately address the research needs and optimize the potential for implementation, equitable resources should be focused on all of the areas.

### Application and Policy Issues

Many application and policy issues were discussed and narrowed to the following:

1. What level of representation is required to obtain reasonable and defendable results?

2. Understanding of the uncertainty inherent within the process. How can the analyst "bracket" the uncertainty.

3. Determining the role and type of modeling approach for specific policy questions will need to be addressed.

4. Establishing an evaluation framework for potentially many different modeling approaches should be done before many of the new tools are implemented.

### Models and Process

Expressed by the group was a need have a broader based approach on model development. It was felt that current emphasis still seemed to be primarily focused on traffic simulation. Other topics for further research included;

- Modeling demand sensitivity to changes. The changes can be in the form of new information

technologies or an actual physical change in the transportation supply.

- Research on the modeling of multi-modal interactions, including non-motorized and freight and goods travel, on both the supply and demand side should be furthered.

- Urban activity micro-simulation should be enhanced. In particular the gap between the ability to simulate population and the seemingly lack of attention to employment must be narrowed.

- Continue model development in the area of activity schedules/plan generation. Examples include tour based modeling and trip chaining.

**Methodological Framework**

Discussions on the framework(s) in which the new applications are to be used generated a lot of debate. The following summarizes the groups priorities for further research and direction.

- How will the new techniques handle different time and spatial scales?

- How will decision hierarchies be incorporated into the new methodologies?

- How will the output developed from the models be used and what are the representation and modeling implications?

- How does one interpret the propagation of variance, error, etc.. Within the new modeling methodologies.

- What are the minimum entity representations required within the new framework?

- What techniques need to be developed to accurately assess the models performance?

- How do we address the output/storage challenges inherent in such a data intensive system?

- How can the new models be designed to insure that there would be maximum computational performance?