

Lifelong education as a necessary foundation for success in travel modeling

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Abstract. Remarkable theoretical and practical advances in travel forecasting have taken place over the past two decades. An unintended consequence of this has been a widening gap between research and practice, which this conference is designed to help overcome. There are many possible reasons for this gulf of knowledge. One reason that has become clear to the author in his consulting work is that most practitioners are working with obsolete skills, and have not been able to stay current with the many new techniques being advanced. A lifelong training program to help overcome that gulf is proposed as an essential part of the advancement of travel modeling.

Travel demand forecasting has been an important tool for policy and investment analyses in the U.S. for over forty years. A loosely defined standard practice was established during the early years that has endured to today. The principles of this practice, based upon four-step sequential models of travel demand, are rather well known and documented in the literature. A number of universities offer courses in the subject, as well as federal and some state transportation agencies. It is thought that most transportation planners in the U.S. are familiar with the process, with many possessing the knowledge and experience necessary to apply, extend, and maintain such models.

There has been considerable research and development work in the past decade that seeks to move the field beyond sequential models. Activity and tour-based models have been widely discussed in the literature, and several promising implementations have been achieved to date. Freight has become an important issue in transportation planning, but their dynamics do not map well to the familiar four-step modeling paradigm. Work on large-scale simulation models such as TRANSIMS has also opened new frontiers in travel modeling. Planning applications of dynamic traffic assignments have sprung up within the past year, and seem to be ideal complements for activity and tour-based models. Finally, there is a resurgence of interest in and development of integrated land use-transport models in several locations.

All of this “new age modeling” is rapidly moving beyond many of the theoretical and practical limitations of the current practice in transportation planning. This has required researchers to draw from a number of disciplines not normally encountered in travel modeling. Recent advances and techniques from other large scale simulations in meteorology, operations research, economics, natural resources modeling, and logistics are all integral parts of the current research. Moreover, software development has become an important part of the overall research and development work. The skill set needed to approach many of these new models is impressive in its breadth, as well as departure from current practice:

- Travel choice behavior (solid foundation in discrete choice modeling concepts)
- Activity-based travel analysis
- Traffic science, control systems, and intelligent transportation systems
- Network dynamics and disequilibrium
- Simulation analysis and modeling, with particular emphasis on microsimulation and sample enumeration

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- Object-oriented programming
- Database systems
- Spatial analysis tools and techniques
- Integrated land use-transport modeling

These subjects will require an adequate background in mathematics, statistics, and microeconomics. While most transportation engineers and planners have an adequate grasp of the first two prerequisites, their background in economics is typically shallow. Transportation planners with degrees in disciplines outside of engineering usually lack an adequate foundation in all three areas.

There are presently very few training opportunities for practitioners in any of these areas. MIT and the University of Sydney offer weeklong intensive courses in discrete choice modeling that have been highly acclaimed. MIT also offers a weeklong course in the modeling and simulation of transportation networks.¹ Ken Train has also put together an excellent distance learning course on discrete choice methods with simulation.² All are a step in the right direction. However, these particular courses are mathematically rigorous, which limits their appeal and suitability for planners and modelers without a strong quantitative background. Moreover, these courses cover only a few of the topics identified earlier. The author is not aware of any program that offers training in the broader list of new age modeling skills.

The National Highway Institute also offers introductory and intermediate courses in travel modeling. There are undoubtedly a number of other short courses available through planning agencies, university extension services, consultants, and software vendors. These courses are most have a “nuts and bolts” orientation that facilitates rapid assimilation of the concepts, in a format that does not intimidate participants lacking a strong quantitative background. The weakness of such courses is that they cannot only impart a broad overview of the topic at hand. Participants often leave short courses with enough knowledge to begin participating in model development and application, but of course lack the deeper understanding and experience needed to design, implement, test, and evaluate all but the simplest of travel modeling systems. This can hardly be seen as a criticism of such courses, for they are intended to meet the needs of entry-level planners, not mid-level and senior modelers seeking to expand their skill base.

If formal training in these newly relevant areas is not readily available, how will transportation planners and modelers acquire these skills? The evidence to date is not encouraging. Ken Cervenka has facilitated an online Focus Group seeking input about whether and how to move towards new age models. Similar dialogue has progressed through the TMIP listserv. The views expressed are all over the board, but it quickly becomes apparent that many participants are either not speaking the same language or do not feel they understand these new concepts well enough to enter the debate. Furthermore, the absence of formal mentoring or training programs beyond those already noted speaks for itself. There are few distance learning opportunities for graduate degrees or certificates in transportation planning or engineering, and none tailored to travel modeling or simulation.

As with our new age modeling techniques, it is helpful to turn outside of our profession to find compelling solutions. There are numerous executive MBA programs that incorporate

¹ Information about the MIT and Sydney courses can be found at http://web.mit.edu/mitpep/pi/courses_topic.html#data_modeling and <http://www.itls.usyd.edu.au/professionaldevelopment.asp>, respectively.

² See <http://emlab.berkeley.edu/users/train/distant.html>.

distance learning in some or all of their coursework. The idea of professional certificates in emerging technologies is gaining currency in many universities. Most of these programs cater to professionals with established careers, residences, and families. Such students typically cannot take extended leaves of absence to participate in traditional university degree programs. So the course work comes to them, often supplemented with brief periods of residency to gain interaction with professors and colleagues.³ Such an instruction format would pay significant dividends for modelers seeking to keep their skills current. They would obtain a deeper exposure to the subject material than possible with short courses, but without the disruption of returning for full-time studies.

If one accepts the value of closing the gap between researchers and practitioners, and that current training opportunities offer neither the content nor depth required to do so, the question quickly becomes how this might be overcome. A continually evolving training program taught by the leaders in research and development of travel models can certainly play an important role. The MIT and Sydney courses are compelling success stories that can be extended to many of the other topics identified earlier. There are several obstacles to overcome in this regard:

- Universities (and just about everyone else) respond to incentives. Without a strong federal commitment to such a program there is little likelihood that such a program will be developed or maintained.
- Most public agencies and individuals cannot afford the cost of tuition and travel for such courses, especially if six to ten of them are required to complete a certificate or graduate degree. The establishment of a scholarship fund for public agency planners will be imperative to make such a program affordable.
- Public agencies will need reasonable assurances that the staff they send to such training will remain at their agencies long enough to benefit from the investment.
- Preference should be given to practitioners working for agencies preparing to or in the process of implementing new age models.
- No single university has faculty with established track records and interest in all of these topics. The simple solution would seem to be a joint program between leading universities.

A formidable amount of effort will be necessary to launch and shepherd such a program. However, new age travel models cannot succeed in practice without corresponding investments in human capital. Such investments will not be made without active and concerted efforts by the developers and consumers of travel models. There are few models of such collaboration between the transportation profession and academics to guide us. It is unquestionably a topic worthy of attention by the Transportation Research Board, its sponsors, and the profession as a whole.

³ Many executive MBA programs only meet on campus for one four-day weekend per month and perhaps a few weeks during the summer. The rest of the course work is done by the student at home, often with directed reading or lectures delivered by streaming video. This obviously places an additional burden on the student to keep up, since formal class meetings are further apart than with traditional lectures in residence. The success of the executive MBA programs suggests that most students have the maturity and motivation to thrive in such a program.