Supporting Transportation Planning Models in Small Metropolitan Planning Organizations through Partnerships and Innovative Methods

Ayman Smadi
Advanced Traffic Analysis Center
North Dakota State University
P.O. Box 5074
Fargo, ND 58105
Ayman.Smadi@ndsu.edu

ABSTRACT

Metropolitan planning organizations (MPOs) must develop and maintain transportation planning models to support a multitude of system decisions and transportation and land use policies. The main components of transportation planning models include travel demand estimation, calibration, and network performance assessment. Evaluating network performance is a straightforward process that compares estimated service levels to those established by each community. However, the model must be calibrated before future traffic levels are examined. Traffic counts on key routes usually receive great attention during calibration, and they may trigger institutional conflicts. Estimating travel demand involves predicting the number of trips by activity.

Although the basic microeconomic principles used to estimate trips are straightforward, applying them to capture trip making behavior accurately gets to be a tricky endeavor. The availability and quality of local data may be the most critical obstacle that MPOs must face when estimating travel demand. This problem becomes even more acute in small MPOs, which lack the resources to undertake significant primary travel data collection. The lack of data also impacts the ability to calibrate models to reflect an area’s unique characteristics and to allow reliable future forecasts. Furthermore, in many instances, the smaller MPOs lack the staff size and expertise necessary to develop, run, and maintain transportation planning models. Many smaller MPOs have difficulty recruiting or retaining skilled transportation modelers.

This paper presents an innovative approach that uses a partnership between academia and local, state, and federal transportation agencies to meet transportation modeling demands in North Dakota. The program consolidates all model development, enhancements, maintenance, at the Advanced Traffic Analysis Center (ATAC) at North Dakota State University to maintain all travel demand models in North Dakota. Furthermore, ATAC is the sole entity designated with the role of running models in support of the needs of various MPOs, state DOTs, and consultants. This paper discusses the approach to establishing the program, lessons learned, and challenges.

Key words: metropolitan planning organizations—transportation planning models
INTRODUCTION

Metropolitan planning organizations (MPOs) have to develop, maintain, and update transportation plans to guide transportation and land use (and land development) decisions. Proper transportation planning is key for achieving a transportation system that supports the vision and goals of communities, i.e., safety, mobility, economic opportunity, clean air and a clean environment, and quality of life in general. It is no surprise that across the country in large metropolitan areas and rural towns alike, growth and development (and their implications on traffic and congestion) are receiving increased attention. One of the challenges for today’s transportation officials include providing (and maintaining) a transportation system that supports the existing activity system and, more importantly, future growth. Another major challenge is to provide support with very limited transportation budgets, increased public scrutiny, and strict environmental demands.

Transportation planning is therefore governed by extensive and detailed requirements at the federal, state, and local levels (U.S. Congress). At the heart of these requirements is how transportation models are developed to support transportation plans. Transportation planning models generally incorporate several main components to account for trip making behavior by individuals given their socioeconomic characteristics and the attributes of available transportation services (mode-specific infrastructure and services). Given the potentially large number of travelers within a metropolitan area, individual decisions are often aggregated to the zonal level for similar land-use and socioeconomic characteristics. This aggregation, however, must be handled with great care and preferably supported by local travel data. The transportation planning process has been standardized over the years and is frequently referred to as the four-step process. The four steps are trip generation, trip distribution, modal split, and trip assignment. Each of these main components produces essential output that is used by subsequent steps, and therefore impacts the overall accuracy of the model.

Although each of the model steps on its own uses basic microeconomic principles, combining these steps into a modeling system that effectively addresses analysis scenarios is a complex process. The relationship between transportation and land use is dynamic and can best be characterized as multifaceted. Furthermore, predicting future growth and the associated demands on the transportation system is not an easy exercise and requires substantial data and different types of modeling systems (i.e., statistical, socioeconomic, political, financial, and transportation networks). Naturally, transportation modeling software was developed to address these needs. However, these software models have also gotten more complex with the availability of computing abilities and now frequently include GIS to facilitate data analysis. As a result, the level of resources often implies how detailed and sophisticated these models will be in a particular application.

Adequate and accurate data are probably the most essential (and the most resource-intensive) component to support modeling. Access to and retaining qualified staff for developing and maintaining transportation models are increasingly becoming critical issues as well for both public transportation agencies and private sector transportation firms. The developments in the complexities of the modeling systems and the decisions/issues they have to support will only add to the shortage of qualified individuals who can operate and support them. Microscopic simulation tools are increasingly used to model traffic operations with extensive details that allow a user to analyze various modifications to transportation networks and traffic behavior. These tools are now being used in combination with traditional planning models. Interfaces between planning and operations are being emphasized in new generation models, such as the U.S. DOT’s TRANSIMS (2001), capable of simulating second-by-second movements of every person and every vehicle through the transportation network.
The issues of resources and data availability are more critical for smaller MPOs. These MPOs lack the funding and the staff resources to meet the data requirements and maintain state-of-the-art models. It is very common for these MPOs to rely on private consultants to develop, run, and maintain their models. However, such an arrangement could create a less-than-perfect situation where agency personnel have limited access to the model. Furthermore, the consultants who are often based at a different location may lack the knowledge of the modeled area, which becomes crucial for scenario analysis and model calibrations.

Due to these factors, a transportation planning modeling support program was envisioned to assist in modeling needs in North Dakota. The remainder of this paper will discuss this program, describe the participating partners and institutional relationships, illustrate the types of projects included, and highlight its success stories from over three years of operation.

SMALL MPO NEEDS

This section briefly describes some of the common characteristics of smaller MPOs, which significantly impact their ability to develop and maintain transportation planning models. For the purpose of this discussion, small MPOs are those metropolitan areas with a population between 50,000 and 200,000. Although some smaller urban areas with populations under 50,000 may still carry out transportation planning modeling, they do not have to meet the strict federal planning requirements for officially designated MPOs.

Some of the distinguishing characteristics (and issues) of smaller MPOs most relevant to transportation planning models include the following:

1. Resources
2. Limited data availability
3. Growth potential
4. Institutional complexity (interjurisdictional and interagency issues)

Although these issues were largely observed in the three MPOs included in the support program in North Dakota, they may very well be representative of other similar-sized MPOs nationwide. In fact, similar issues were identified in 2000 by the Transportation Research Board to be of high priority in the new millennium (Schutz 2000). Other potential issues identified in that effort included new technologies (intelligent transportation systems), modeling techniques that include multimodal issues, and communications and information overload (Schutz 2000).

Resources

The lack of resources is often cited as the most critical challenge facing government agencies in general and transportation agencies in particular. However, for smaller MPOs, inadequate resources could have detrimental effects on their ability to carry out transportation plans and fund supporting modeling activities. In most cases, the lack of funding leads to an inability among smaller MPOs to hire or retain full-time staff to support transportation modeling activities. Therefore, cost minimizing strategies often override the need to meet minimum planning and modeling requirements. Below is a discussion of some of the specific resource issues and their impacts on transportation planning modeling in smaller MPOs.
Limited Funding

The smaller MPOs (with populations under 200,000) usually receive less federal funding and have less control over how their funds are used. In some cases, the state transportation agency (DOT) plays a major role in influencing MPO programs and may also provide modeling support to smaller MPOs. However, in states that are predominantly rural, developing and maintaining transportation planning models may not be a high DOT priority.

In terms of absolute dollars, the current law (U.S. Congress) provides a disproportionate amount of funding for transportation planning activities, compared to traditional infrastructure and capacity enhancements. Table 1 shows funding amounts under TEA 21 for major programs, as well as metropolitan planning for selected states. The table also shows the percentage of the population living in urban areas among the selected states, based on 2000 Census data (U.S. Census Bureau 2000). The portion of federal funding allocated to metropolitan planning is mostly less than 1% of total funding awarded to the states.

Table 1. Selected 2002 funding levels (in millions) and population in urban areas

<table>
<thead>
<tr>
<th>State</th>
<th>Interstate maintenance</th>
<th>NHS</th>
<th>STP</th>
<th>CMAQ</th>
<th>Metro planning</th>
<th>Total</th>
<th>% for metro planning</th>
<th>% population in urban areas</th>
</tr>
</thead>
<tbody>
<tr>
<td>CA</td>
<td>346.5</td>
<td>443.3</td>
<td>539.8</td>
<td>292.5</td>
<td>30.0</td>
<td>2,822</td>
<td>1.1%</td>
<td>94.4</td>
</tr>
<tr>
<td>CO</td>
<td>63.4</td>
<td>80.6</td>
<td>85.9</td>
<td>19.9</td>
<td>2.8</td>
<td>396.6</td>
<td>0.71%</td>
<td>84.5</td>
</tr>
<tr>
<td>IA</td>
<td>53.8</td>
<td>76.8</td>
<td>81.5</td>
<td>6.9</td>
<td>1.1</td>
<td>368.2</td>
<td>0.30%</td>
<td>61.1</td>
</tr>
<tr>
<td>ND</td>
<td>23.3</td>
<td>64.6</td>
<td>35.7</td>
<td>6.9</td>
<td>1.0</td>
<td>201.7</td>
<td>0.49%</td>
<td>55.9</td>
</tr>
<tr>
<td>SD</td>
<td>27.7</td>
<td>54.2</td>
<td>38.9</td>
<td>6.9</td>
<td>1.0</td>
<td>223.7</td>
<td>0.44%</td>
<td>51.9</td>
</tr>
<tr>
<td>UT</td>
<td>53.1</td>
<td>38.4</td>
<td>46.3</td>
<td>8.8</td>
<td>1.6</td>
<td>239.9</td>
<td>0.65%</td>
<td>88.2</td>
</tr>
<tr>
<td>WY</td>
<td>39.8</td>
<td>69.5</td>
<td>28.1</td>
<td>6.9</td>
<td>1.0</td>
<td>214.6</td>
<td>0.46%</td>
<td>65.1</td>
</tr>
</tbody>
</table>

Funding Data and Software Updates

Modest MPO planning budgets also impact data collection and software updates, which affect not only model development, but also model calibration. Travel surveys provide a region with valuable travel behavior information, essential for developing models that can effectively explain local and regional travel behavior. These studies are expensive and time consuming. Therefore, travel survey data are often outdated or nonexistent in smaller metropolitan areas.

Software companies are continuously marketing new planning products or software upgrades. Most of these products cost thousands of dollars to purchase. It is extremely difficult, because of cost constraints, for an MPO to update their planning software continuously when new products are introduced. They must decide on the best and most economical software for their own individual purpose.

Few Modelers

Developing and maintaining transportation planning models require extensive knowledge. Universities serve as a valuable resource to expose future transportation college graduates to transportation planning and modeling. However, at the undergraduate level, many transportation-related programs, like Civil Engineering, do not incorporate specialized transportation planning classes into the degree curriculum.
Therefore, graduates may not have the fundamental technical background needed to support transportation planning functions.

The lack of young professionals exposed to planning is one reason why smaller MPOs have a difficult time recruiting knowledgeable staff. If an MPO successfully employs and trains a young talented modeler, the MPO will often lose them to a higher paying job at another organization. Again, the MPO will be faced with the reoccurring problem of finding experienced modeling staff.

**Growth Potential**

Because of their relative size and the availability of vacant land, the smaller MPOs continue to experience significant growth. The quality of life in these MPOs, especially low crime rates, good air quality, and little traffic congestion; continue to attract new residents. Additionally, aggressive economic development efforts often contribute to an increasing population as new jobs are created. With this growth, the relative impact on the transportation system could be quite significant. For example, a single housing development that changes land use from farmland to single-family dwellings could greatly impact the level of service on surrounding roads. Similarly, specialized stores, such as a Super Wal-Mart, Home Depot, and others, could become regional shopping destinations, attracting traffic from surrounding areas. Again, the impact on the transportation network is profound.

**Limited Local Data**

Data availability issues are common to MPOs of any size. However, these issues are more critical in smaller MPOs largely due to limited resources and the relative inexperience in developing, calibrating, and maintaining transportation planning models in these MPOs. Several types of data are required to support effective modeling, including socioeconomic data, travel behavior, and network traffic flows.

Since transportation planning models directly depend on estimating the level of demand on the transportation system, data to support accurate trip generation are most important. Most MPOs have good land use data for the traffic production step; however, the availability of data for estimating attractions is mixed. For intermodal (freight) traffic generation, there is a severe shortage of useable data. That shortage, combined with modeling shortcomings, means that freight traffic flows are ignored completely in metropolitan transportation planning models in smaller MPOs.

Travel behavior data support three main modeling components: trip generation, trip distribution, and mode choice. The main source for these data has traditionally been travel surveys (also referred to as O-D surveys). These types of data are either unavailable or outdated in the smaller MPOs and hence have little value to support transportation planning models. Budget limitations are perhaps the main cause for smaller MPOs’ inability to undertake major travel survey data collection.

Network traffic data are essential for understanding the traffic assignment process and calibrating the transportation planning models to base conditions. Although many smaller MPOs collect traffic flow data periodically, these collection plans often are done in absence of any consideration as to how the data would be used to support model development or calibration. Therefore, there is less data coverage (both location and time period), which means less comparable data for model calibration.
Multi-agency/multi-jurisdictional issues

The smaller MPOs have to deal with other (and perhaps more powerful) agencies in balancing their transportation plans. In North Dakota, each of the three MPOs has one major city with the majority of the population (and hence the funding), giving it more control in future plans. This issue may have significant impacts on transportation planning modeling, i.e., favoring the wishes of the more powerful agency. Similarly, state DOTs may have a more powerful role and may dictate the modeling approach, model calibration, and even choice of software.

PROGRAM DESCRIPTION

This section describes the details of a transportation planning modeling support program established at North Dakota State University (NDSU) in 2001. The program was developed in response to growing modeling needs among the program partners and their inability to retain full-time modeling staff. The emphasis of the program is on modeling enhancements that would be useful regardless of the modeling software used and would be applicable for North Dakota MPOs and other small- to medium-sized urban areas. The program builds on a strong partnership between the Advanced Traffic Analysis Center (ATAC) at NDSU and various state and local transportation agencies. ATAC has staff and students with significant experience and familiarity with analysis tools and links to transportation research organizations and groups. The program consolidated planning model improvement activities in North Dakota at ATAC. This has afforded individual MPOs, NDDOT, and private consultants greater opportunities to benefit from modeling expertise that would otherwise be unavailable.

Program Partners

The program was developed at ATAC in partnership with the three MPOs of Bismarck-Mandan, Fargo-Moorhead, Grand Forks-East Grand Forks; NDDOT; and the Federal Highway Administration Division in North Dakota. The role of NDDOT and the FHWA was to facilitate the partnership and also to ensure that MPO transportation planning models meet federal and state requirements. It is also common that for some of the major corridor analyses, federal, state, and local agencies are involved in interpreting the results and finalizing future design plans. Therefore, effective participation from all of these agencies is paramount for the success of the transportation planning modeling support program.

Institutional Arrangements

The program is guided by a steering committee consisting of MPO directors, an urban engineer for NDDOT, a planning engineer from the FHWA’s division, and two ATAC staff. The committee is responsible for maintaining the required partnership agreement for the program and allocating programmatic funding. Committee meetings are held twice a year to discuss progress and identify potential work activities. The respective advisory boards for each MPO have endorsed the partnership agreements and are updated on program activities as needed. Both technical and policy MPO advisory boards have been supportive of the program due in large part to the value they perceive from its services.

The program is governed by a master agreement ratified by program partners and NDSU. The master agreement specifies, among other legal provisions, the annual contribution amounts, the types of activities allowable under the agreement, the performance period, and the mechanism for conducting work by special request. Model improvement, model runs, corridor analyses, and other special studies are covered under addenda to the master agreement. These addenda can usually be processed within one or two business days, thus enhancing ATAC’s ability to respond to the MPO’s analysis needs as they arise.
The program funding may be categorized into two main sources: core funding and activity-based funding. Core funding for the program consists of annual contributions in the amount of $5,000 made by each of the program partners. These contributions are used to provide ATAC with basic funding for general program activities that benefit all partners. Initiatives that affect more than one MPO, such as acquiring additional modeling tools, technical training for staff, and general operating expenses for the program, are covered under the core funding. Activity-based funding consists of model improvements, corridor analysis, or special studies requested by any of the program participants. Activity-based funding has been at least double the amount of the core funding per year.

Private consultants participate in the program in a variety of ways, but mostly through a contract with one of the program partners. The types of services conducted to support consultants’ work falls under the master agreement and are often covered by provisions between the contracting MPO and the consultant. Consultants also participate in training activities offered under the program. They are also valuable participants in model improvement forums.

To illustrate how MPOs and their consultants interact with ATAC modelers, it may be worthwhile to describe a typical arrangement for a corridor study. Generally, the MPO consults with ATAC staff during the preparation of the Request for Proposal (RFP) in order to identify potential modeling needs and possible resources for the study. The RFP specifically states that the selected consultant would identify modeling needs (i.e., model runs to reflect analysis scenarios) and work with the MPO and ATAC on coordinating the analysis. ATAC is paid through the MPO, which may retain a portion of the project award to cover the modeling cost. All work requests are submitted through the MPO using the standard addendum form. All the changes to the model are accounted for and documented by ATAC staff, and hence there is little chance of compromising the model. Furthermore, there are significant cost savings that result from this specialization because of the familiarity of ATAC’s modelers with the analysis and their ability to use enhanced software tools to meet the requirements.

**Program Activities**

This section discusses the types of activities conducted under a North Dakota transportation planning modeling support program. The discussion is intended to highlight major types of projects rather than list all possible studies or activities.

**Model Overhaul**

This category of program activities includes major model enhancements, such as changing the traffic analysis zones’ structure, changing the model traffic generation formulas, adding new trip types, etc. These types of enhancements are typically done during major transportation planning model updates, which also entails developing a long-range transportation plan. Additionally, implementing new software to support transportation planning models also falls under this category.

Under the current program, a major model update for the Fargo-Moorhead area was completed, and one is underway for the Grand Forks-East Grand Forks area. During the Fargo-Moorhead update, the number of traffic analysis zones was almost doubled from a 1995 version of the model. Additionally, transportation network components were revised to reflect recent changes. The model’s approach to measuring network performance was also enhanced by refining intersection cost (delay) values based on traffic operational analysis in the area.
Model Calibration

This type of work involves calibrating existing models to a particular year or land-use and traffic conditions. The calibration is mostly triggered by major changes in conditions or analysis to support major projects. The calibration does not involve major model changes (i.e., model estimation formulas remain intact).

Sub-Area/Corridor Analysis

There is often a need to apply macro-level travel demand models to a micro-level or corridor level analysis. Since demand models are developed regionally, model refinements may need to be made to run these analyses. Refinements may consist of adding traffic analysis zones, adding roadway segments, adjusting network loading, or adjusting predictive socioeconomic data. Because of model sensitivity, any future model adjustments need to be examined carefully to verify that results are reasonable compared to the calibrated model. Corridor analyses provide valuable demand and network performance information that aids in determining future intersection configuration, roadway geometry, and future roadway right-of-way boundaries.

Most of the recent work in this area has focused on determining projected turn volumes. For this type of analysis, agencies provide current turn volumes at all corridor intersection approaches. These current counts are compared to the calibrated model volumes to produce a future year adjustment coefficient. This coefficient is applied to the future turn volume according to a method described in National Cooperative Highway Research Program Report (NCHRP) 255 (Pederson and Samdahl 1982). For each predictive intersection turn volume, target volumes are established based on the error between the current counted and the calibrated model volume and the future year predictive turn volume. This method assumes that the future year model will also predict that particular movement flow. Since applying a target value affects the volume balance at each intersection, ATAC developed an application that uses a matrix estimation program to balance the intersection volumes. This program minimizes the deviation of the assigned volume to the target value while maintaining balanced intersection flow through the corridor.

PROGRAM BENEFITS/ACCOMPLISHMENTS

This section highlights some of the key benefits and accomplishments of North Dakota’s transportation planning modeling support program. This information is largely based on the program activities during the last three years. It should be noted that the recognition of these benefits by program partners has resulted in renewing the program for another three years. It is expected that the program will continue to grow in the future by tackling additional issues.

Model Improvements

One of the most direct benefits resulting from the program was to allow partner agencies to have a concerted effort for upgrading and updating existing travel demand models. Due largely to resource limitations and the dependency on outsourcing for developing models, improvements were not easily attainable. The program steering committee frequently discusses potential model improvements at its semi-annual meetings. Two of the MPOs have officially set up transportation model improvement committees to identify and guide future improvements.

One of the first MPOs to receive a major model update was the Fargo-Moorhead Metropolitan Council of Governments. The update included doubling the number of analysis zones, revising the network structure,
refining intersection costs, improving model calibration, and implementing additional software features that facilitate the analysis. One of the important supporting activities of this model update was to take advantage of GIS capabilities in preparing the data and communicating the results to both technical staff and elected officials. Primary data were collected in order to support network performance measurement (i.e., travel time) and enhance the model’s ability to capture additional trips (school trips). It should be noted that due to the effective partnership built in the program, these benefits were not restricted to the Fargo-Moorhead Metropolitan Council of Governments. Other project partners were aware of these improvements and how they could utilize similar strategies to improve their own models. Also, the data collected in the Fargo-Moorhead area, such as school trips, would apply in the other two MPOs due to their similar characteristics.

**Modeling Consistency**

One of the main advantages to the North Dakota support program is providing a forum for all three MPOs and the NDDOT planning staff to discuss common modeling issues. Also, by having a single source for technical expertise at ATAC, the process of reviewing and calibrating models is greatly enhanced. Most importantly, this partnership provides for private consulting firms to participate, depending on the type of projects, and still benefit from this consistency. Consultants request model runs with various land use, transportation network, or other model input scenarios from ATAC under the service agreement with the MPOs. ATAC is responsible for making the changes, running the model, and presenting the results to the MPO and consultant. This mechanism ensures the integrity of the travel demand model, since all the changes are carried out by the ATAC staff, while meeting the modeling needs of the project partners and their consultants.

**Modeling Software**

Many transportation agencies struggle with the issue of transportation-related software, whether it is for traffic operation analysis or transportation planning. Software purchases can consume significant portions of the limited budgets of small MPOs. The recent trend of more powerful computer processing continues to fuel larger, more complex, and more expensive models. Additionally, it is difficult to interpret the results produced by the various transportation planning software tools. Other issues related to modeling software are maintenance and updates. Therefore, ATAC has been designated with the role of maintaining current modeling software used in North Dakota and evaluating needed upgrades. ATAC’s modelers frequently evaluate new versions and enhancements to the modeling software in order to identify justified changes. In turn, the MPOs benefit by having a single source for current information on state-of-the-art modeling software.

Finally, modeling software-related training for agency staff can often be costly and time consuming. The North Dakota program addresses training needs by providing opportunities for informal and one-on-one training to partner agency staff. Having in-house training greatly cuts back on travel costs, training fees, and time away from the job for the staff. Furthermore, receiving training from ATAC ensures consistency and provides opportunities for using examples from actual MPO models in the training.

**Stability and Continuity**

Recruiting and retaining qualified modelers present great challenges to all transportation agencies, but more so for smaller MPOs. The limited budgets of the smaller MPOs often affect their ability to offer competitive compensation to potential modelers. As a result, smaller MPOs generally lack modeling staff with the experience necessary to operate, maintain, and update the model. They rely on consulting firms,
either through a retainer arrangement or on a case-by-case basis, for meeting their modeling needs. Having to work with different firms and deal with changing modelers within these firms are not conducive to programmatic model enhancement and updates. Unless there is a commitment on the MPO’s part (and the associated resources are available), the consulting firm has little incentive to perform model improvements and enhancements.

Under the support program, ATAC maintains properly trained staff and students to ensure the stability of the program. Also, due to the large reserve of graduate students familiar with transportation modeling, it is possible to increase staffing levels to meet project deadlines. ATAC has to illustrate to the program steering committee that adequate resources are committed to the program. In turn, they assist in securing additional resources needed to carry out the program activities.

**Responsiveness to Modeling Needs**

It is common for land use changes or development decisions to trigger the need for modeling analyses to examine their impacts on very short notice. This means that changes in conditions must be represented in the model and calibrated prior to producing the results. Given the level of detail involved in corridor studies, it is often necessary to create a sub-area with a higher level of detail than the metropolitan model. After the sub-area analysis is complete, interpreting the results and communicating them to the decision-makers can be a political and time consuming process.

These types of requests have been streamlined in the North Dakota program. First, there are procedures in place to identify potential analysis needs ahead of time as much as possible (programmed needs). Second, a prioritization system for handling agency requests was established by the program’s steering committee to recognize the timing constraints for certain requests. Third, a process for conducting sub-area analyses was developed with the program partners to ensure expedited approval of the results. Technical and decision-making staff from the MPOs, cities, and NDDOT participated in a training workshop on the methods and software tools typically used in sub-area analysis. Finally, ATAC has acquired software enhancements to facilitate and expedite sub-area analysis.

**Economics**

In addition to providing responsive and effective modeling expertise, the North Dakota program offers significant cost savings to the program partners. This is largely due to the effective partnerships established by the program. The three MPOs and NDDOT provide base funding for the program through an annual participation fee. The base funding covers some of the core activities, such as model enhancements, training, and software updates. Agency-specific work activities are handled on a cost-per-use basis. However, these costs are minimized in the program due to the familiarity of the modelers with analysis procedures, therefore eliminating start-up time. It should be noted that the cost savings are also passed on to the private consulting firms conducting corridor analysis.

**Supporting private consultants**

One of the initial challenges faced during the program establishment was to sort out the relationship with and impacts on private consulting firms. At issue was possible competition between an academic institution and private industry. However, the program steering committee quickly realized how this program can help private consulting firms that are strong in corridor studies but may lack modeling experience. As a rule, ATAC does not compete on corridor studies, but rather provides modeling support to the contracting agency and its consultant.
Further, the types of model enhancements afforded by a research environment are not typically available in the private sector. The knowledge and techniques developed through the program are therefore helpful to both private consultants, as well as other small MPOs.

**Recruiting and Training Students**

By establishing the transportation planning modeling support program at NDSU, both graduate and undergraduate students are involved in the program activities. Typical student involvement ranges from data processing to researching model enhancements. As more students are exposed to transportation planning models, their future career decisions (and opportunities) are greatly enhanced. This is especially true for undergraduate students in civil engineering who often lack any particular specialization. Participating agencies and private consulting firms can potentially recruit new graduates who are familiar with transportation planning models.

**Additional Support Areas**

The success of the program in providing transportation planning modeling service has triggered additional support areas for the program partners. The program strengthened the relationship between MPOs and NDDOT with the university and created effective mechanisms for sharing ideas and leveraging resources. Specifically, there has been an increase in support activities in the areas of intelligent transportation systems and traffic operations.

**Program Challenges**

Although the North Dakota support program has been successful in meeting the desired objectives for the MPOs, NDDOT, and NDSU, this success did not come without difficulties at times. The most significant challenges were experienced during the early stages of establishing the program. It should be mentioned, however, that these challenges were not insurmountable due to a critical need among the program partners, strong partnerships with the MPOs and NDDOT, and a clear and measurable benefit to program participants. Below are some key challenges and how they were addressed in the North Dakota program.

1. *Developing a clear business plan.* This may be the most critical factor in selling the program to transportation agencies’ technical staff and policy makers. The business plan must outline goals and objectives, potential institutional arrangements, funding, accountability, and possible conflicts.

2. *Securing stable funding.* Transportation agencies generally shy away from multi-year funding agreements. However, stable funding was crucial for the university in order to invest in setting up the program and developing the required expertise and resources. As a compromise, the program was initially set up for two years with the possibility of canceling the agreement. After the initial two-year period expired in 2003, the program was renewed for three more years and is expected to be renewed for a similar period after 2006.

3. *Clarifying program relationships with private sector consultants.* This issue had to be faced early as the program was formulated. There was concern among consulting companies that provide transportation planning and traffic analysis services in North Dakota that this program would compete with their business. However, once the program’s activities and benefits were outlined, these concerns were greatly reduced. Further, the program steering committee provided a leadership role to stand behind the program and assure consultants that their business would not be affected. The key to selling the program was to emphasize ATAC’s role in model enhancements that ultimately benefit consultants who need model results to support their work.
4. **Reconciling differences between MPO’s and academic environments.** MPOs must meet strict planning requirements and follow a structured process for approving their plans. This creates pressures on the MPOs to meet deadlines and get approval from several layers of advisory bodies. In contrast, academic research staff work in a less structured environment, where there may be high emphasis on long-term model improvements vs. the immediate needs to meet requirements. This issue is best addressed by continuous dialogue among project partners in order to balance desired improvements with the real-world planning needs of the MPOs and the DOT.

**CONCLUSIONS**

Smaller MPOs face significant challenges in maintaining effective and up-to-date transportation planning models. Constrained budgets, modest staffing levels, and limited expertise create a difficult environment for developing, supporting, and enhancing planning models. In this paper we described an innovative program that meets the metropolitan modeling demands in three MPOs and NDDOT through a strong partnership with a university. The program facilitates resource pooling, knowledge sharing, and ensuring consistency across the state. It also provides mechanisms to support various analysis needs involving private consulting firms. Over the last three years, this program has demonstrated great success by yielding substantial model improvements, providing training opportunities, improving the timeliness of analyses, and involving graduate and undergraduate students.

It is important to remember that the success of this program did not come without some difficulty. One of the initial drawbacks involved consultants viewing the arrangement as competition. Another difficulty focused on bridging the thinking gap between MPOs, the DOT, and the university. However, both of these concerns were alleviated by developing a clear business plan in concert with potential program partners. Perhaps this may be the best recommendation to other states interested in developing similar programs.
REFERENCES


