# Workshop on Transit and Highway Operations and Management Techniques

## Workshop Summary

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This workshop focused on methods to estimate near-term demand changes due to typical automobile, transit, and paratransit projects. Participants reviewed a number of operations and management techniques to determine whether travel-analysis methods are available and used in planning. Options included those dealing with TSM options, freeways, reserved lanes, priority parking, transit fare and service changes, express bus operation, and demand-responsive services. Methods of travel demand include traditional models, newer disaggregate methods, and pivot-point and other hybrid procedures.

The workshop addressed five questions with regard to transit and highway operations and management techniques:

1. Are these techniques applicable in each of the five planning contexts, i.e., strategic, long-range, project, microscale, and operations?
2. Do travel analysis methods exist for each of these techniques and are they adequate?
3. Are these travel analysis techniques used in practice?
4. What is the cause of the gap between the state of the art and the state of the practice, where it exists?
5. What is needed to improve the quality of travel analysis for each technique, and what further research is needed, if any?

With regard to the first question, it was concluded that these transit and highway operations and management techniques are generally used in the shorter-term planning contexts at the subregional level. Their primary application is in project planning, microscale planning, and operations planning. There are, however, some specific applications in strategic planning (such as assessing alternative transit fare and service policies and the effects of regulatory reform) and in long-range planning [such as the evaluation of high-occupancy-vehicle (HOV) operations plans for new freeways and systemwide analyses of transit networks].

The remaining four questions were addressed for each highway and transit operations and management technique. A number of issues and conclusions recurred in the course of discussions. These are summarized below.

### STATE OF THE ART

The paper by Miller and Kirby provided the background for this discussion.

There is a wide range of travel analysis methods available for analyzing transit and highway operations and management techniques. No one method is applicable to all techniques. There is little information on the quality and cost of these methods. They have not been subjected to a uniform set of tests to permit distinguishing among them in terms of their relevance, accuracy, and economy of use. No documentation exists on the failure of these methods to aid others in their use.

Research is needed in a number of application areas to improve travel analysis methods, such as transit-route planning, urban truck travel, some demand-responsive and specialized transit services, and planning for infrastructure rehabilitation.

### STATE OF THE PRACTICE

The paper by Ryan summarized the state of the practice for this discussion.

Operational planners are not making widespread use of new travel analysis methods. Rather, they are using results adapted from other areas. A great deal of professional judgment is being used instead of detailed analysis. There appears to be little concern for accuracy. Where the implementation of a transit or highway operations or management technique does not achieve the desired results, adjustments are made in the implementation. In some situations, the implementation cannot be changed and the area must accept the outcomes or terminate the application, if possible.

### CAUSE OF THE GAP BETWEEN ART AND PRACTICE

The gap between the state of the art and the state of the practice in travel analysis methods is primarily institutional in nature. Most of the applications of transit and highway operations and management techniques are small; the impacts of these projects are also small. There is a lack of awareness of analysis methods and applications, an inadequate supply of trained practitioners, lack of access to computing facilities, and insufficient data to utilize sophisticated travel analysis methods.

Many of these operations and management projects, such as ridesharing, are implemented by private companies or nontransportation agencies, such as transit services for the elderly and handicapped, and larger issues of social benefit are not of interest. Often these services are implemented because of legal requirements, such as service for the elderly and handicapped, or to solve a specific problem, such as ridesharing to reduce parking requirements at a work location. In such situations, there is little interest in the evaluation of alternatives.

In addition, many of the organizations implementing these projects do not have personnel familiar with travel analysis methods, nor do they have adequate data to perform the analysis. Often the projects are too small to permit expenditures for an adequate travel analysis.

In public agencies where there is concern for the impacts, benefits, and costs of alternative techniques, there is a lack of information on the quality, cost, and applicability of new travel analysis methods. Traffic engineering departments and public transit agencies often use simple methods or rules of thumb tempered by professional judgment. Even where techniques exist for a particular application, they are often not packaged for easy use.

### CLOSING THE GAP BETWEEN ART AND PRACTICE

There are many opportunities for closing the gap

between the state of the art and the state of the practice. There are three categories of actions that can be taken:

1. Make new travel analysis methods more usable,
2. Increase the capability of operational planners, and
3. Improve communication between those with knowledge and those who need it.

In the first category, there is a need to synthesize information on new travel analysis methods. Practitioners need to know the array of methods that exists, range of applicability, cost and time requirements, data needs, accuracy of results, and where to obtain them. The methods must be packaged in a user-friendly environment and be easily accessible. Technical assistance must be available to help in their use. It will be necessary to provide the level and intensity of technical assistance that was typical in the 1960s when conventional travel analysis methods were disseminated.

As part of this effort to diffuse new travel analysis methods, there is a need to demonstrate the utility of travel analysis in supporting decisionmaking and minimizing risk. It must be clear that the cost of good travel analyses will be more than paid for by avoiding poorer choices of projects to implement.

The application of travel analysis methods to these small-scale applications looks well suited to the use of microcomputers. With the cost of microcomputers dropping, their acquisition is within the budgets of many organizations that previously did not have access to computing facilities. Use of these computers would make the cost of applying travel analysis methods low enough to permit their use for smaller projects.

Case studies were favored as a means to demonstrate the usability and usefulness of travel analysis methods. Practitioners can see how these methods were actually applied, the type of results achieved, and their use in the overall planning and decisionmaking process.

With regard to some applications of travel analysis methods, there appear to be mismatches between the level of sophistication and the analytical requirements of the application. Travel analysis methods for ridesharing, rural service, and high-density circulator systems were identified as areas where this seems to occur.

With regard to the second category, practicing planners will require training in order to use the new generation of travel analysis methods no matter how user friendly they are made. As with any professional field where new ideas and techniques are being developed, the professionals must acquire this new knowledge to be continuously useful. Opportunities must be found to retrain the cadre of practicing planners over a wide spectrum of need. Some planners who are familiar with the theory of these new techniques may require only short courses to catch up on the most recent methods. Others may require longer-term training to learn the new concepts and applications. Still others may need sabbaticals to permit a major retraining experience.

It is understandable that little of this retraining has occurred in urban transportation planning. Operating agencies find it difficult to budget the funds and spare the staff time for such retraining. There has not been a clear understanding of the importance of retraining especially in a field that seemed so new only a few years ago. But an increasing number of public and private organizations are coming to recognize the necessity of continuous training of their personnel to avoid functional obsolescence.

There are opportunities for additional training courses and materials over the entire spectrum of need. The greatest need is in the area of applications. Existing courses given by FHWA and UMTA were considered to be excellent. More of this type are needed. Courses and seminars in which applications are exchanged are particularly helpful. Where possible, the courses and seminars should be given at several locations around the country to minimize the time and cost of attending them.

In the third category of actions, communication needs to be facilitated between those having knowledge of the applications of new travel analysis methods and those needing it. This problem is particularly acute in the area of highway and transit operations and management techniques where the universe of possible users is so large and where many organizations are not connected to communications networks that provide such information. It is clear that many potential users of travel analysis methods do not know when to do a travel analysis nor the methods available. And, even worse, they do not know where to obtain help. Many are reluctant to ask for assistance and expose their ignorance.

There is a clear challenge to develop new approaches to providing technical assistance to the large number of potential users of travel analysis methods with their widely varying capabilities and analysis needs. Information brokers that can identify users and establish communications networks would substantially facilitate the diffusion of new travel analysis methods.

Two approaches currently being used are meeting with considerable success. The SMD Briefs, which are one-page summaries on the progress of various service and methods demonstrations, were considered informative and succinct. The announcement cards from the Technology Sharing Program reach a large audience with brief descriptions of newly available reports.

Distributions of reports, however, have their limitations. Most practitioners do not have immediate use for the material in these reports. They are filed and must be recalled when needed. Also, once the initial distribution of the report is made, it is difficult to obtain copies. Further, potential users of this information need assistance in applying it to their circumstances. In their paper, Miller and Kirby discuss the currently available summaries on the state of the art. It is clear that considerable work will be required to bridge the communications gulf.

## RECOMMENDATIONS ON RESEARCH AND PRACTICE

In the realm of transit and highway operations and management techniques, where the bulk of projects is small, there is still a need for simple, accurate, and easily usable travel analysis methods. It appears that the use of the microcomputer in the application of these techniques would increase their accessibility while keeping the cost of their use low.

Several specific subjects requiring research and methodological development were identified. However, for many of these techniques, actual travel impact information is very limited. This is hampering theoretical and methodological developments. More empirical data are required on before-and-after conditions in order to produce forecasting methods. Wherever possible, data should be collected on these types of techniques. As these data become available, syntheses of experience should be produced and disseminated, and research should be undertaken to understand the impact process and to develop additional travel analysis methods.

In the area of longer-term travel analyses, there is a need to improve the forecasting of variables that input to the travel-forecasting methods. These include population, employment, income, automobiles, and economic indicators, both at the aggregate and the disaggregate levels.

Finally, many of these techniques are implemented by agencies and organizations with which planning agencies have little or no communication. These include transit operators, traffic engineering agencies, parking organizations, private ridesharing operators, maintenance departments, and social service agencies. If planners are to effect the selection of alternatives and the analysis of impacts to achieve communitywide benefits, a substantially increased level of cooperation will be required.

# Travel Analysis Methods for Systems Management and Operations: The State of the Art

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As public budget pressures limit funds to expand and operate urban transportation systems, planners are searching for more productive ways to use existing transportation resources through improved systems management and operations. This transportation system management (TSM) philosophy presents many new challenges to highway and transit planners, traffic engineers, and system operators. In particular, planners must consider and assess numerous short-term (operational within one or two years) actions to improve traffic flow, parking, and public transportation services. Usually the most difficult planning task involves estimating the changes in travel demand due to the proposed actions.

During the past few years numerous research approaches have been tried and considerable empirical evidence has been accumulated in efforts to advance the state of the art in short-range TSM planning. However, the typical planner often does not use these newer techniques or have ready access to this information.

In this paper, we discuss the usefulness of the recent summaries and syntheses of travel responses to short-term actions. We then briefly review a large set of state-of-the-art travel analysis methods and comment on their application, ease of use, and data needs. Finally, we suggest some issues that need to be addressed as researchers and planners strive to improve the travel analysis methods needed for short-range transportation planning in the 1980s.

## PLANNING CONTEXT: TSM AND OPERATIONS PROBLEMS

An important difference between short-range, small-scale TSM planning and longer-range planning is that usually little time (and money) is available in short-range planning for travel analysis or new data collection. Planners often have to respond relatively quickly to funding crises and political pressures to do something. Fortunately, for many of these short-term problems, it is not too costly if the travel demand estimates are not very accurate. Unlike the longer-term or capital-intensive projects, many of the short-term actions--transit and dial-a-ride service changes, ridesharing incentives, and some traffic operations and parking improvements--can be implemented on a smaller-scale trial basis and then modified as the demand develops (or does not). A trial-and-error approach, of course, cannot be used for some actions, and in all cases there may be real credibility and political costs for errors. For many short-term actions, however, we have to accept that spending more time and money for additional demand analysis and data collection may not really reduce errors. If we acknowledge this uncertainty and plan the implementation accordingly, the cost of wrong estimates often can be minimized.

Another distinguishing feature of this type of planning is the different types of planning backgrounds and approaches that may be involved, depending on the specific problem. Rather than a few persons in an MPO or other regional agency applying a relatively well-defined planning process, persons doing short-term planning exist in many places--transit agencies, city and county public works departments, carpool and vanpool promotional organizations, social service agencies, parking authorities, and private organizations such as taxicab companies. These persons all may make estimates of short-term demand responses, but their abilities, interests, institutional constraints, and planning approaches vary tremendously.

One illustration of the variety of planning and travel analysis problems is the list of the various TSM-type actions originally proposed in the 1975 DOT regulations. Other classification schemes also have been used to group TSM measures based on the compatibility of individual techniques, common institutional problems, the planning analysis detail, and the supply and demand system impacts. [For example, see reports by Remak and Rosenbloom (1), Voorhees (2), and Wagner and Gilbert (3).]

Recently, nine operating environments have been suggested as a way to organize TSM analysis and implementation (4). Operating environments relate to

1. Major transportation facilities, such as freeway corridors, arterial corridors, and modal transfer points;
2. Major urban concentrations, such as large employment sites, major activity centers, and outlying commercial centers; and
3. Geographical settings within urban areas, such as neighborhoods, CBDs, and regional environments.

Several advantages of using these operating environments for organizing analysis were suggested:

1. They delineate an approach that is consistent with traditional analysis,
2. They are compatible with existing planning techniques for projecting TSM impacts, and
3. Each environment can have identifiable goals and measurable objectives.