Workshop 2

DEMAND FORECASTING FOR LONG-RANGE AND CONTEMPORARY OPTIONS

OBJECTIVES

Identify, review, and evaluate current and proposed travel demand forecasting techniques and procedures for use in assessing long-range urban transportation options that use contemporary technology.

Recommend new and improved forecasting procedures that are responsive to requirements of using travel forecasts in assessing the options.

Develop a recommended program of research that is responsive to the identified requirements.

OPTIONS

Long-range options include all actions or programs that use contemporary transportation technology or institutional procedures and that may be planned, designed, and implemented in 5 years or more. Examples that use contemporary transportation technology include freeways and expressways on new or existing rights-of-way; new or reconstructed arterial streets; new bridges, major interchanges, or other major link improvements or bottleneck relief; rail or bus rapid transit lines on new rights-of-way with or without supplemental feeder modes; new terminal facilities such as consolidation of transit terminal facilities or major new parking programs involving new construction or demolition or both; and demolition or reconstruction to a smaller scale of an existing urban expressway. Examples of options using contemporary institutional procedures are land use controls such as zoning, water, and sewer service regulations; direct development such as renewal, purchase by eminent domain for open space, or government installations; and increased operating subsidies.

PARTICIPANTS

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Report

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Workshop 2 reviewed many current problems and issues within the context of the methodological procedures that were developed in the late 1950s and the early 1960s, for they form the basis for many current techniques. Discussion ranged from the view that long-range target-year planning was no longer valid to the view that long-range target year planning should be extended to cover even longer study periods of 30 to 40 years.

Out of these wide-ranging discussions a concensus emerged that it was possible to get more out of existing technical processes. Present processes have great flexibility and adaptability for solving problems not considered in the past. For instance, plan staging and its implications on the selection of the recommended plan requires only more time sequence analysis and perhaps a faster iteration process (through simplification of coding techniques so that more alternatives can be studied. Better use of existing techniques can also be obtained by developing better summarization routines for the models involved and by making greater use of graphic outputs.

Workshop 2 not only considered the present technical processes but also took a look at where major improvements were needed immediately as well as during a longer period. Three types of improvements are needed: On-line improvements that can be made immediately, near-term improvements that involve only the application of current research findings to actual problems and require no further research and, long-term improvements that require basic research.

Participants identified the following 3 areas as being those where improved techniques are most needed:

1. We must be able to make timely responses as issues are raised. Some capability already exists for doing this, but a great deal more is needed.
2. Most region-wide system plans are being closely scrutinized on a corridor basis, and new tools must be developed that will provide precise information on volumes, passengers, costs, and environmental impacts within the corridor. Generalizations from the regional level will no longer suffice.
3. Although current processes do provide rudimentary analysis of land use and

transportation relations, more precise information is needed.

With regard to the current state of the art of long-range transportation planning, participants concluded that (a) projects are conditioned on what went before and what current issues are; (b) the target-year approach to developing a transportation plan does not indicate whether such a plan can be achieved and does not stress incremental evaluations of the long-range system; (c) impacts cannot be modeled in detail so that benefits and consequences can be easily identified; (d) even short-range solutions take as many as 10 years to implement; (e) energy consumption, which will become a major consideration in transportation planning, has not been considered; and (f) models are not sensitive to activity systems so that the effects of transportation decisions on land use and vice versa can be predicted.

Workshop 2 identified several issues that researchers must address in improving long-range and contemporary travel demand forecasting methodology.

1. It is generally insufficient to use a fixed land use plan as the basis for forecasting travel demand and its impacts. Long-range transportation planning implies land use changes resulting from the implementation of transport plans. In addition, a land use plan conceived in isolation of the location, timing, and design of transport improvements may not be unachievable. Thus, a fundamental issue in long-range planning is, How can the effects of transportation on land use and land use on future travel demand be incorporated?
2. The emergence of a "systems view" of transportation problems within urban areas has enabled the planner to greatly improve his conceptual tools for evaluating plans consisting of 2 time-staged sequences of projects. However, the political process as well as the operational necessity of reviewing, programming, budgeting, and construction dictates that projects be addressed and their analysis and justification be carried out one at a time. How can these 2 divergent viewpoints be reconciled?
3. Long-range plans have been criticized for their failure to deal with existing and short-term problems. Preoccupation with complete systems has obscured the benefits to be obtained by implementing partial systems. How can travel demand forecasts be made to address these short-run projects?
4. Travel demand forecasting has always been concerned with flows on individual facilities. Yet, flows by themselves have neither a beneficial nor a detrimental meaning. Decision-makers need to know the consequences of particular courses of action, and thus models must go beyond flows to impacts. How can models be so designed?
5. Can forecasts be produced by streamlining the process, e.g., by using abbreviated coding devices; simplified representation of proposed projects, corridors, or system elements; and a summarization of data depending on the decision to be made?
6. Can incremental forecasts be made to provide 5-year time series information and to examine for each succeeding increment the numerous possibilities and their implications on the previously committed elements of the system? Such techniques should deal with population, employment, land use, and the associated travel demand.
7. Can geographic identification be built into forecast information to permit ready correlation with housing, population, business and employment, recreation, and social indicators?
8. Can graphic devices be developed to quickly show areas where future travel demand will create problems on the existing system? Can areal summaries of vehicle-miles of travel and capacity provide similar insights, and can measures of performance be developed to indicate on an area basis the mileage of highways or transit routes required to provide needed service?
9. How can travel information be used to describe the impact of an action or lack of action to a policy-maker? These impacts should be stated in terms of costs (fares), congestion, opportunities for business (CBD) employment, health care, and the like.
10. Can the effect of tolls, fares, and other charges or restrictive regulations be adequately modeled so that their effect on travel demand can be estimated with reasonable accuracy?

11. Can travel distribution be estimated by time of day? Can peak loads be estimated directly on links?
12. Can the error of estimate be readily ascertained in a simulation process so that this factor can be considered in evaluating impacts?
13. When a new facility of limited capacity is put into the system exogenously, can its impact on other facilities be measured?
14. Is there really an opportunity to make significant changes in land use and to evaluate their impact on travel demand? Are these changes isolated within a region? What is the extent of their impact?
15. Can the forecasting process produce data for evaluating noise, pollution, accidents, and mode choice on a project, corridor, or regional basis?
16. Can we estimate or model the immediate effect of a minor transportation facility improvement? Does this have to be done by a regional model?

Participants decided that transportation impacts should be classed by groups affected rather than by type of measure. The consensus was that this was an important distinction because the measure used or the category of impact is viewed differently by each of these groups and that one level of detail might suffice for one group but be totally inadequate for another. Table 1 gives the 5 groups identified and the impacts.

Workshop 2 discussed specific areas for methodology improvement and research based on a hypothetical urban area. The urban area has a population of 1,000,000+, has been the subject of a conventional comprehensive land use-transportation study of the 1960s, is now experiencing problems not only with the overall regional system, has had several major corridor controversies, and has problems associated with the local transit system with regard to how many buses to purchase and what headways should be used on certain routes.

A summary of the discussion is given below. On-line recommendations cover those improvements that can be made with present capabilities; near term covers those for which knowledge now exists but its method of application must be developed; and long term covers those for which basic research is required.

ON LINE

Disaggregate Household Data

Better use of existing travel survey information can lead to improved travel prediction. The condition of existing home interview files should be reviewed, and specific recommendations should be made for use of the data on a disaggregate basis.

Parking

Present assignment models are not sensitive to changes in parking policy or pricing. These factors greatly affect travel mode choice to the CBD, and assignment processes should be improved to reflect changes in parking conditions.

Transit

Improvement in present capabilities is needed for the analysis of transit service in both large and small urban areas. In large areas, major route changes or implementation of new service is often considered in specific corridors of the region. In small cities, new local service or the tailoring of local service to meet specific requirements may be proposed. Transit analysis for either of these areas must be detailed and quick, and both are difficult with existing methodology.

Table 1. Transportation impacts and groups affected.

Group	Impact Type	Factor Impacted
User	Direct cost	Fuel, parking charge, tolls, other pricing mechanism
	Indirect cost	Accidents, insurance, depreciation
	Service	Travel time, accessibility, comfort and convenience, frequency, safety, availability, regularity, diversion
	System staging	Availability, circuity, cost
Nonuser	Displacement	Economic and social costs
	Environment	Noise, air quality, aesthetic impact, impeded access, congestion, accessibility, land use
	Urban structure	Density, public utility cost, open space, taxes
	Travel generation markets	
	Staging of system	
Carrier	Direct cost	Capital investments, revenues, operation
	System operations	Type of technology, major facilities location, type of operation, station location, headways
	Sensitivity	Errors in predictions of ridership and cash flow
	Risk analysis	Based on above
Noncarrier	Direct cost	Accessibility for employees, customers, products, buyers, and sellers
	Development	Neighborhood viability, opportunity for development, relative attractiveness of areas
	Risk analysis	Use above factors to review cash flow situations
Government		
Federal	Direct cost	Capital, operation, revenues
State	Direct cost	Capital, operation, revenues, operating assistance
Local	Direct cost	Capital, operation, revenues, operating assistance, tax base, capital grant program

Macromodels

The transportation system plan (transit and highways) for each metropolitan area should be checked for appropriateness of size, that is, the number of miles of major facilities or frequency or level of service. Capability to do this now exists with macromodels, but specific application techniques need to be developed for typical urban areas.

Land Use

Existing land use growth allocation models are sensitive to transportation network changes. However, these models have not been used in most transportation studies, and their capabilities have not been fully used in measuring the effect of proposed transportation systems on land use. Standard methodology should be developed to ensure that land use implications of proposed transportation plans are studied in each urban area.

Implementation

Too often, long-range transportation system plans are developed without a thorough review of the sequence in which the plan elements should be implemented. Based on the number of plans that have been rejected in recent years because certain links were no longer acceptable to the public or to elected officials, strategies must be developed for using existing models to make incremental forecasts and analysis on staging of transportation plans. If these techniques are used, the plan that is most economical 20 years hence would not necessarily be the plan that is most economical when a time series analysis is made on the implementation of its incremental parts.

SHORT TERM

Direct Demand Models

Direct demand models appear to be one means of obtaining better forecasts for transportation corridor projects. A set of specifications for data requirements should be developed immediately for use in such models. One method of developing these specifications is to bring together the practitioners who are about to initiate general travel surveys for their urban areas and the researchers who desire to do direct demand modeling so that data requirements for both can be obtained simultaneously.

Model Documentation

Too often models are developed and used without documentation of input requirements and the types of output that can be called for. Specifications are needed for present and future models so that users may fully exploit the model and have all necessary inputs available before the model is brought on line. Effective evaluation must also be based on statistical fit of the model to data for both present and future conditions.

Pilot Study

A method to analyze corridor travel is urgently needed. Current tools have been designed for regional analysis but do not address many of the detailed questions within a specific corridor or subarea. Workshop 2 proposes that problems of this type be identified within 3 urban areas and that applied research projects be initiated to develop specific analysis techniques.

Equilibrium

Present assignment models do not necessarily reach equilibrium between traffic flow and system capacity. This condition must be achieved if network flows are to be realistic in simulation models. Therefore, present assignment techniques should be modified, particularly for peak-hour analysis, to achieve a condition of balance.

Peak Hour

Investigation should be undertaken to find the length of the appropriate peak period for network travel analysis. Most analysis is now done on an ADT basis, and conversion to peak hour is approximated after the network assignment has been made. Current microassignment techniques should be reviewed, and the appropriate time period should be determined that is representative of peak-volume conditions on transportation networks.

Application Time

Current transportation models require weeks and, in may instances, months for their application. Methods to shorten the application period should be developed so that models can be applied more frequently to evaluate many more alternatives than are currently considered.

Tree Trace

In minimum time path algorithms, present tree techniques use either time or distance. A tree trace algorithm should be developed that can use a number of different parameters (including cost) and permit these parameters to be used in combination, i.e., weighted average if deemed appropriate.

LONG TERM

Management

Many urban transportation planning studies have not exhibited a full understanding of the planning process or the management of its individual parts. A management planning program should be initiated to ensure that study directors as well as key technical staff members have adequate training to manage efficiently and productively.

Monitoring

A specific program of monitoring must be established to ascertain the change in trip-making and other key parameters on which travel demand forecasts are made. This program must be instituted in enough cities so that change can be monitored on a geographic, political, and social basis.

Total Impacts

The transportation planning process and its technical tools must be sensitive to and responsive to environmental, housing, and other social needs. New tools must be developed to permit more detailed analysis of the impacts of transportation at the subarea or neighborhood level where these factors are most significant.

Urban Structure

Present land use models measure the impact of transportation system change on land use but only at the regional scale. Models should be developed to measure the effect of land use changes and transportation system changes on each other.

Traffic Volumes

The end product of transportation planning is the provision of travel volumes to the designer of the facilities. Present techniques require much hand adjustment of region-wide travel volumes and in many instances do not provide enough detail for the designer. Improved methods of developing design parameters are required.