Integration and/or Unification of Highway and Transit Simulation (Mode Split Including Automobile Occupancy)

The biggest shortcoming to transit simulation is our inability to simultaneously represent highway and transit networks and build paths that utilize both automobile and transit. We continue, with a few notable exceptions, to proceed along the notion that a minimum path exists between two points measurable by a single metric—usually time or sometimes weighted time and cost. Yet it was shown in 1957 that there are at least two dimensions to travel that people consider: time and cost. For some people, the least-time path is preferred. For others, the least-cost path is chosen. These paths are usually not one and the same. Moreover, the infamous irrelevant mode issue that has plagued the users of the logit model and single-dimension minimum paths disappears when two-dimensional trees are built and used as a basis for allocating travel to mode.

Zone size and access links also plague the simulation of transit. Walk access and ride access are clumsily handled in most procedures.

The notion that highway times and costs are the same to people making a choice between automobile and transit regardless of car availability seems childlike. Yet only limited attention has been given to the problem of estimating car ownership by small areas.

The automobile occupancy problem, so vital to high-occupancy-vehicle projects, has not proven to be amenable to multinomial logit efforts—but certainly not for lack of trying to calibrate models.

CONCLUSION

There is more that could be said and complaints, regrets, and criticisms that might be spewed forth. But my conclusion is simply that unification of transportation planning is long overdue.

One cannot make local plans without considering the impacts that regional growth, traffic, and transportation facilities will have on the locality. Nor can one plan regional transportation facilities in the absence of local inputs regarding transportation facilities and actions. There must be an integration of planning across time, space, and capital requirements if we hope to get the most out of our planning efforts, not to mention our planning dollars. There is very little standing in the way of such a unification—MPOs were born, painfully, in order to house such a unified approach.

The theoretical concepts necessary are all available for a flexible hierarchical approach to representing transportation systems; representing the spatially detailed settlement pattern of regions (the socioeconomic characteristics of regions); the storage and retrieval of these data at the appropriate level of detail, geography, and time; the models of social interaction that result in travel; the diagnosis of problems; and the evaluation of alternative actions directed to the solution of those problems.

Much of the software for implementing these concepts is in place. A handful of regions are already undertaking the approach. What is needed is to continue this effort and move to a sharing of methods and procedures.

Perhaps out of this conference can be born a user's organization to compare and share techniques and methodologies that can hasten the unification of transportation planning functionally, spatially (local to regional), financially (low-capital to capital-intensive), and temporally (short-term, long-range).

An Outline of the Emerging Urban Transportation Planning Process

Douglass Lee

Transportation planning and the transportation planning process have been severely buffeted from sources both inside and outside the field, primarily throughout the 1970s. To transportation planners who experienced the clear direction and exciting achievements of the previous post-war decades, the prolonged milling about of the current period has been frustrating and distressing. Yet this apparently aimless indecision has permitted a productive review and rethinking of the basic planning paradigm, and a new paradigm is finally taking shape as the fog lifts. This paper is an effort to describe and clarify the new shape.

The slowness of the new pattern to emerge is because its difference is at the most fundamental level. This does not mean that everything must be done over from scratch; on the contrary, many professionals are actively practicing in the new paradigm while thinking of themselves as being forced into an undesirable (and preferably temporary) departure from the old process. New theory, new methods, new concepts, and new professional standards are necessary, of course, but most of the tools are already available and in use by transportation planners. Primarily, it is the framework by which these elements are integrated and synthesized that is changing.

The long-range comprehensive planning model gradually ground to a halt as a result of the changing nature of the problems and the weight of additional requirements placed on the old model. The beauty of a unified approach was lost in the tangle of environmental impacts, citizen participation, procedural requirements, and conflicting objectives, all of which had the effect of reducing the level of clarity, consensus, and closure. A unified approach can be constructed from the rubble of the old model, but not by rejecting the more recent demands placed on it and stripping away those functions. Instead, unity must come from addressing the planning problem at a higher level of abstraction, in a manner that is at least as rigorous as the old one.

POLITICAL AND TECHNICAL SIDES OF PLANNING

Because planning is concerned with decisionmaking in the public sector and because professional planners are necessarily involved in the political process, a workable planning framework must incorporate some concept of the political decision process. It is not adequate, however, to simply say that policymakers determine policy and planners carry it out. The information used by policymakers should come, in part, from planners, and the kinds of decisions that call for both political and technical inputs cover a very wide range. From deciding how much to spend on the national highway system to deciding which streets to sealcoat, the choices have both political and technical elements (Figure 1). Moreover, planners have a professional role to play in facilitating the resolution of conflicts, both in establishing the terms of debate and in conducting or participating in portions of that debate.

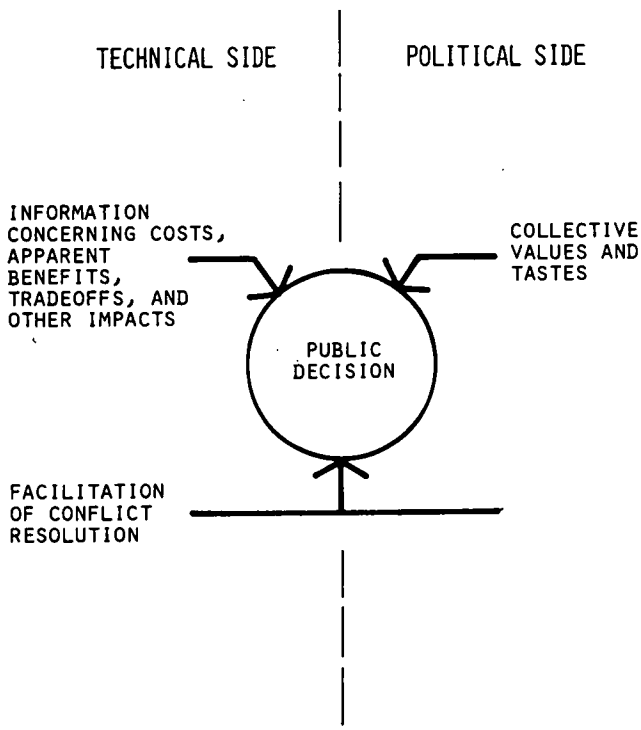

Figure 1. Technical and political inputs to policy decisions.

Unfortunately, the realization that planning is inherently political and that planners have a responsibility to serve the needs of the political system has sometimes led to an abandonment of planners' technical responsibilities. Many planners have found it difficult to reconcile their technical contribution with the nature of the political process, seeing them as conceptually incompatible and the resulting compromise as necessarily flawed from a technical perspective. In a proper conception of the planning function, this incompatibility need not arise.

Thus, an essential feature of a suitable planning paradigm is the integration of the political and technical aspects of planning. The professional objective should be to seek, in any given decision, the proper balance between technical and political inputs and to combine them in a way that makes the results of the decision process better than they would be if the process were either more politically or more technically dominated.

NATURE OF THE POLITICAL DECISION PROCESS

Planners must learn to accept certain characteristics of the political process as given and seek to improve the results of the public decisions within those constraints. Policymakers, for example, make decisions in a sequence (not simultaneously), and they are timed so as to take advantage of the relevant factors. Issues are resolved partially, and in many steps, not once-and-for-all. Thus, a comprehensive planning model asks the political process to do things that it will almost never do in a democratic society.

The "old" transportation planning process has been characterized as "long-range, comprehensive, top-down, end state, closed-option planning," in contrast to a process that needs to be "short-range, incremental, politically open, and multi-optioned in the sense of narrowing but not eliminating choice" (D. B. Lee, *Improving Communication Among Researchers, Professionals and Policy Makers in Land Use and Transportation Planning.* U.S. Department of Transportation, March 1977; George Wickstrom). Unless planners have very sound reasons for wanting to alter these characteristics, an ideal planning framework is one that optimizes the planner's contribution within these constraints. Such a framework is feasible and available.

Planners should keep in mind that their major source of impact is in ideas, not in numbers, computers, or expert credentials. The ideas embodied in the traditional planning process have been largely ignored by the political process for reasons that seem valid in retrospect. We should seek to construct and communicate a different set of ideas that will be more productive in dealing with current and future problems.

COMPONENTS OF PLANNING

One way to initially slice the planning problem is into three functions: the generation of alternatives for consideration, the estimation of impacts for each alternative, and the evaluation of which alternative to select (Figure 2). [This trichotomy is closely parallel to Herbert Simon's description of decisionmak-

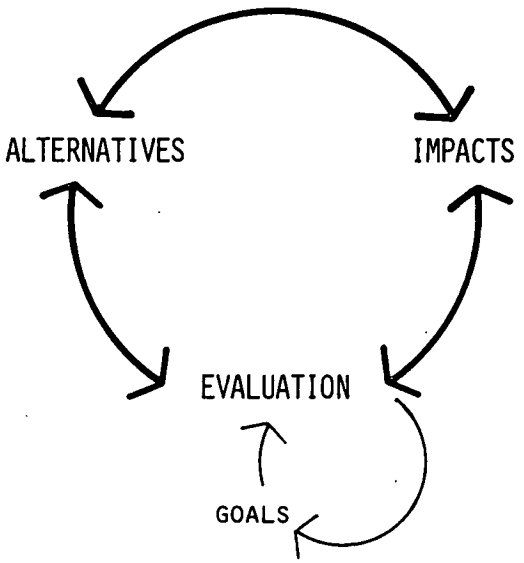

Figure 2. Functions of the planning process.

ing as Intelligence (the scanning of the applicable domain for evidence of problems, i.e., impacts), Design (construction of alternatives), and Choice (selection of the preferred alternative).] The listed order is arbitrary, as the functions have no natural sequence. Evidence about impacts of current policies leads to ideas for alternatives and the basis for evaluating them; debates about goals lead to concern for desired alternatives and means for achieving them. Each function has both technical and political sides. Alternatives are generated by the political process as well as by technical analysis, impacts are continuously articulated through the political process by those perceiving consequences for themselves, and evaluation should ideally combine political values with technical knowledge.

INPUTS TO THE TECHNICAL SIDE OF EVALUATION

As the focus is narrowed to the technical side of planning, attention can be directed at the analytic framework. For evaluation, the information about each alternative should be digested and transformed into two main streams, representing benefits and costs (Figure 3). Although user benefits are not the only source of benefits, they will normally be the major source. All impacts should be recognized in some form, and quantified and valued to the extent that seems warranted. How much this is done depends on professional judgment, but no impact should be excluded simply because it cannot be easily measured. Skills required in this analysis are derived mainly from planning, economics, and engineering.

The traditional urban transportation planning process has been largely consumed with the forecasting of demand over relatively long periods of time. As long as steady growth was the overriding feature of the problem and the direction of public policy was not open for review, a travel forecasting strategy was probably an adequate means of ranking projects within an exogenously determined budget. Current problems, however, are characterized by the need to obtain better utilization of existing facilities and the competition of numerous claims for the allocation of limited resources.

EVALUATION CRITERIA

In providing information to decisionmakers about a particular project under review, a planner would not offer estimates of how many hours a lazy crew would take, how many hours a productive crew would take, and the prevailing wage rate, leaving the decisionmakers to estimate costs for themselves. Yet, when it comes to evaluation, planners have all too frequently taken the position that their professional obligation is satisfied by presenting all the possibly relevant information and digesting it almost not at all.

With few exceptions, all goals and objectives can be categorized under three headings: efficiency, effectiveness, and equity (Figure 4). The efficiency goal is to maximize net benefits for society as a whole, i.e., make decisions that result in the largest positive difference between incremental benefits and incremental costs. No positive or negative impact should be omitted in this accounting, whether or not it can be quantified and valued. Equity is the concern for the distribution of costs and benefits over subgroups of the population. The equity criterion operates more as a constraint than as a normative guide because transportation projects are seldom very effective means for accomplishing equity ends.

Effectiveness is not really a third dimension, but rather a different perspective on efficiency and equity. Because transportation policies and projects exhibit multiple objectives (or at least produce travel benefits in several metrics), cost-effectiveness analysis is rarely adequate or even applicable. Measures of effectiveness can be constructed along a large number of partial dimensions and used for comparison of alternatives, but only if one output clearly dominates (e.g., passenger trips) and there is no doubt that at least one alternative is worthwhile will cost-effectiveness calculations suffice. Effectiveness measures add to the richness of the information but do not substitute for efficiency or equity evaluation.

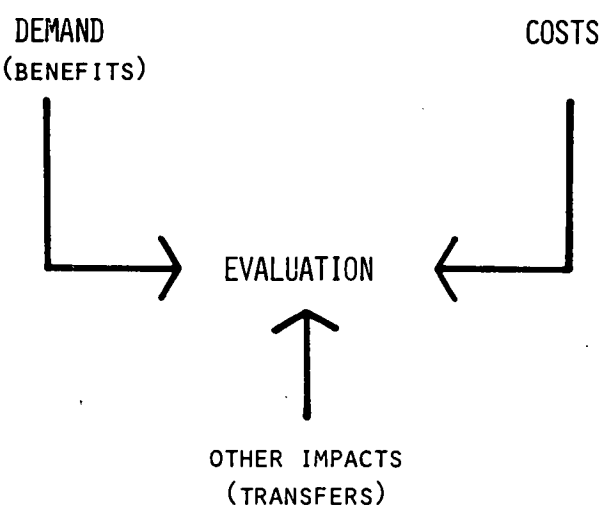

Figure 3. Technical inputs to evaluation.

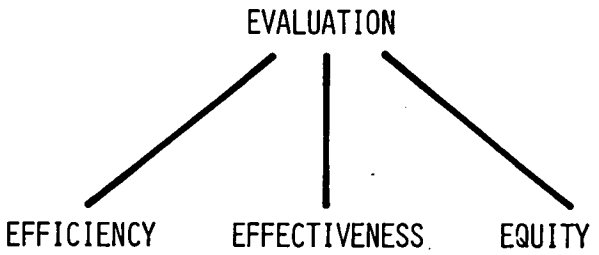

Figure 4. Primary evaluation criteria.

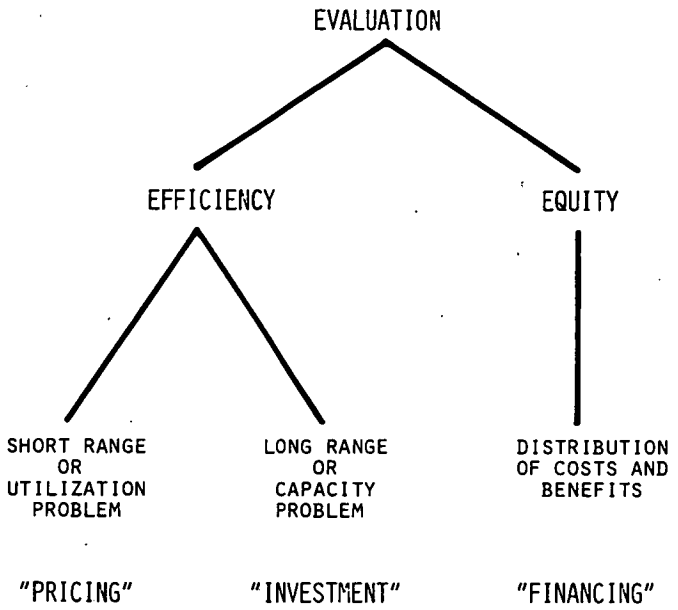

Figure 5. Technical subproblems in evaluation.

A FRAMEWORK FOR EVALUATION

The technical problem of evaluation, then, separates into the two overriding goals of efficiency and equity (Figure 5). Efficiency, in turn, has two subcomponents. The short-run problem assumes that the capacity is fixed and given, and the need is to derive the optimum utilization of that stock. Although the instruments for achieving the optimum utilization are much more numerous than just charging users the correct price, the relevant normative theory (from microeconomics) portrays the problem in terms of price, and other short-run alternatives can be evaluated within a pricing framework. The long-run problem is to adjust investment in the capital stock over time, and optimization along this dimension relies heavily on the general framework of benefit-cost analysis. Equity goals are realized through the instruments by which the policies or projects are financed.

A virtue of this analytic framework is that the three problems—pricing, investment, and financing—are conceptually separable. They also have a natural hierarchy, which is from pricing to investment to financing. Ideally, all alternatives are correctly "priced", i.e., they make optimal use of the capital stock available under the alternative. This applies to proposed as well as existing alternatives. Then, from among this array of "good" choices, the one that maximizes net benefits is selected. Finally, the efficient investment is financed in a way that satisfies equity criteria.

CONCLUSIONS

Only the faintest glimmer of the strengths, depth, and difficulties of using this framework can be provided in this simplified outline. Despite a terminology that is relatively new to urban transportation planning, the new paradigm retains most of the methods and procedures contained in current practice. The major implication is a shift in emphasis toward evaluation. From the standpoint of evaluation, for example, congestion is seen as a problem of pricing (utilization), not investment (capacity). Additional investment may or may not be warranted, in a particular context. Also, the normative structure of evaluation indicates that pricing (e.g., user charges below marginal cost) is not the best means for securing equity objectives. Second-best comparisons are the reality of professional transportation planning, and their analysis and evaluation present challenging problems, but the framework does not change. Externalities (pollution, noise), indirect impacts (land use), and other factors are incorporated into the framework through theory and empirical analysis that has been developing over a long period of time. With a modest amount of retooling, urban transportation planning can absorb and use the large store of available knowledge, both within the field already and in economics, to respond productively to the problems facing the field.