Multi-Modal and Highway Systems Plan

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Current major statewide transportation planning issues are associated with the integration of separate modal agencies into multi-modal state Departments of Transportation (DOTs). Inherent in the creation of DOTs was an unspecified commitment for comprehensive multi-modal policy planning. As a consequence of this integration, a multi-modal transportation systems outlook emerged, and the transportation planning and management assumed a statewide character. The degrees of freedom for carrying out this new task in different states depends on the prevailing style of the general state planning. Since the creation of state DOTs, there has been a trend of shifting toward the "management planning model." This model has been fully implemented in Florida. The state planning procedures in Florida require the DOT to prepare a functional transportation policy plan in strict conformance with the state policy plan. To do this, physical systems studies and planning and multi-modal policy planning are required. This dual planning process requires a common conceptual understanding about three major issues: (a) multi-modal policy role and its scope, (b) statewide modal systems, and (c) the role of modal transportation in multi-modal system. In the process of developing perspectives about its statewide planning tools, Florida DOT also conducted a survey of other state DOTs about their planning activities during the last two decades. The survey results indicated that transportation policy planning differs from state to state. The approaches to statewide highway systems planning are also diverse, suggesting the presence of different understandings as to what such systems are to encompass. The survey also disclosed the presence of confusion about the multi-modal systems planning. On the one hand, the transportation planners firmly believed in the potential of a multi-modal transportation system. On the other hand, as staff members of state DOTs, the planners have done very little to justify such a belief. In conclusion, the survey indicates the need for concentrating research and analysis capabilities, as well as resources for defining the major elements of the new style of multi-modal transportation planning.

A national survey of state departments of transportation was conducted by Florida DOT during the first quarter of 1987 with the purpose of inquiring about planning activities during the 1970s and the 1980s. The survey was part of a Florida DOT effort to appraise its statewide multi-modal planning tools as to their utility in current planning environment. At the core of these tools was the multi-modal forecasting procedures manual, issued in 1979 (*1*), but never used as published.

In the internal appraisal of the proposed procedures, a Delphi (*2*) panel, composed of Florida DOT staff members, indicated doubts about the practicality and reliability of the multi-modal forecasting procedures. Also the panel members agreed that the "multi-modal comprehensiveness" effort complicated the analysis to the extreme, and the panel concurred that extreme complexity is self-defeating in pursuing comprehensiveness in planning. Regarding immediate Florida DOT needs, the manual was found to be deficient in that the procedures failed to address the fundamental statewide highway systems planning issue of how to analytically separate the travel on statewide facilities from local travel.

Among the Delphi panel responses surfaced an interesting contradiction. In spite of the agreed-upon shortcomings of the simultaneous multi-modal systems analysis, more than half of panelists reversed their previous stand by voting that the chances were high for a future need of simultaneous multi-modal statewide systems travel forecasting.

The seeming contradiction between the appeal of the utopian and mainly metaphoric multi-modal systems idea on the one hand and the limitation of operational realities on the other hand appeared to be deeply rooted in the minds of transportation planners. There are reasons to believe that this contradiction has affected transportation planning decisions nationwide during the last two decades. In Florida, the possession of the multi-modal travel forecasting procedures manual, indeed, represented an achievement in terms of the multi-modal philosophy. But the fact that these procedures have not been utilized for two decades indicates that a price was being paid for that contradiction.

The results of the nationwide survey are too sketchy to be used to pinpoint specific impacts of the contradiction in other locations. An overall assessment of the responses, however, indicates "directionless" and limited progress in creating new planning techniques for statewide transportation planning during the two decades. Meaningful insights may be gained from the survey about the statewide multi-modal systems by means of a reference framework that depicts the major transformations of the statewide transportation planning and management environment in recent decades.

REFERENCE FRAMEWORK FOR THE INTERPRETATION OF SURVEY RESULTS

Such a reference framework is depicted in Figure 1, which shows the changes in the transportation planning and management philosophy that have been taking place since the creation of state DOTs. The diagram starts with the metropolitan planning which began in the early 1920s. The major impact that this early planning experience produced upon the formation of planning philosophy was the message that urban areas consisting of contiguous municipalities must be regarded in planning as integrated wholes. This conclusion applied not

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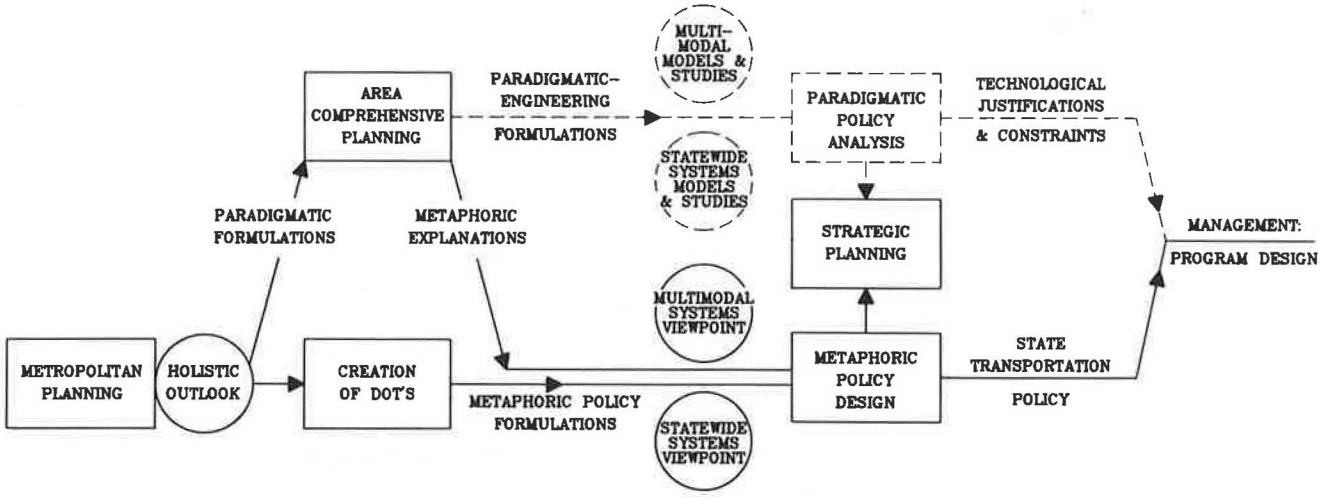

FIGURE 1 Reference framework for the interpretation of survey results.

only to comprehensive development planning but also to planning of individual urban functions such as transportation. Following this holistic outlook, a number of metropolitan studies were initiated soon after World War II. As a result of political resistance, however, the metropolitan self-governance idea did not materialize in the United States, nor did the metropolitan comprehensive planning get off the ground. It was up to transportation studies, a decade later, to assume the task of comprehensive metropolitan planning, which was necessary to study the existing travel demand as well as to forecast future transportation needs.

The demonstrated need for dealing with metropolitan areas as wholes initiated the holistic outlook. Since then this outlook has remained as one among other large area planning and management principles. In Figure 1 the holistic outlook is represented by a circle on the left side.

In conformance with the holistic outlook, rigorous rational models were developed for various aspects of comprehensive metropolitan planning. According to Kuhn's explanation of scientific progress (*3*), these rigorous models and the explanations that these models provided about the metropolitan phenomenon may be regarded as paradigms. Thus, paradigms were formulated for land-use planning and trip generation/forecasting/distribution, as well as travel assignments to facility networks. Figure 1 also shows the process of the paradigmatic formulations as the basis for metropolitan comprehensive planning.

Also, as a consequence of the holistic outlook, a convincing argument was gaining ground: For dealing with the transportation function as a whole, and to make it more efficient, a single transportation department that includes highways, mass transit, rail, air, and water modes for moving people and goods should be established. It was envisioned that the purpose of such departments would be to develop and implement unified transportation policies. In 1967 the U.S. Department of Transportation and similar departments in three states were created (*4*). The decade of creation of other state DOTs coincided with the maturation of the ongoing metropolitan and regional transportation studies. The phasing out of the federal support for large area planning programs followed the transfer of modal transportation systems planning and management to state DOTs.

At the time the comprehensive planning programs were disbanded, they had served their purpose. By means of their "paradigmatic" knowledge and techniques, metropolitan planning had compiled a mass of information on population dynamics, urbanization, travel generation, travel distribution, and others. The initially detected urbanization and travel parameters turned out to be valid in most locations. Discoveries of new knowledge by successive studies were diminishing, and the available knowledge abounded to those capable of accessing it. However, before planning knowledge could be communicated to the individuals who were not planners, the technical paradigmatic language of engineers, in terms of mathematical equations, computer language, and language of relations, had to be rearticulated into a "metaphoric" mode, or the mode of interdisciplinary and interprofessional communications. In this rearticulation the paradigmatic formulations became metaphoric explanations (*5*). Beyond their poetic meaning, metaphors represent verbal expressions denoting implicit and explicit knowledge underlying them or knowledge analogous to the metaphor. The role of models and metaphors in the sciences is an issue of the philosophy of sciences (*6*). All scientific knowledge must be transcribed into metaphoric explanations before the population can relate this knowledge to its organizational and communications frames of reference. For instance, the acronym AIDS (acquired immunodeficiency syndrome) is a scientific paradigm dealing with a particular issue of body chemistry. Upon transferring it to the metaphoric domain, this acronym becomes a metaphor relating the general scientific evidence about AIDS to the individuals' and societal issue domains. Societal issues of the same subject are very different from paradigmatic issues. This difference is reflected by the language used for representing them.

Thus, before the traditional comprehensive planning lost its significance, it had delivered its knowledge in popular relative terms (metaphoric) about household behavior, activities, effects of urbanization forms on travel, patterns of travel choices, and the like. The legacy of comprehensive planning provided the essential set of metaphoric explanations required for further expansion of knowledge into different areas of societal interests. By this, the comprehensive planning legacy

also paved the way for the transformation of planning thinking. The old practice of large area plan making superseded itself.

As shown in Figure 1, this transformation has resulted in dual-track comprehensive planning: the upper track stands for logically rigorous inquiries employing the scientific paradigm approach. This track is identified in Figure 1 as "paradigmatic-engineering formulations." The lower track represents the policy planning that is conducted on the basis of metaphoric knowledge gained from rearticulations of rigorous inquiries and other sources.

In discussing statewide transportation planning in 1982, Creighton also found that it is organized in two parts. The rigorous part he called "substantive" and the policy part a "management" content (*7*). Since then some states have been moving toward the managerial state planning system that requires functional planning for their agencies. Functional planning consists of policy planning on one side and operations planning on the other. The terminology, which has been selected to represent the two tracks of planning shown in Figure 1, depicts more closely the functional planning process than other designations and enables analyzing not only the contents of the process but also the nature of the process itself.

Under the new dual planning process the role of policy planners is to come up with policy designs based on broader than technical planning knowledge. Along the technical planning track, the planners are to come up with logically rigorous planning alternatives taking into consideration technological justifications and constraints. The synthesis of the two tracks is to be accomplished through strategic planning with the participation of the organization's decision makers. As shown on the right-hand side of Figure 1, the ultimate policy formulation is the result of strategic planning. Under such policies the program designs are politically desirable and technologically feasible.

SURVEY ISSUES

The new element of transportation planning on the creation of state DOTs was an integrated transport systems policy planning. Initially it was conceived as a metaphor. Most people had a notion as to what it entailed, but there were few precedents to refer to and follow. Obviously, the policy plan was to be neither a product of a supermodel nor a set of inferences from survey data. Instead it was to be a design of policy statements constructed in response to the prevailing and future multi-modal transportation issues on the basis of available knowledge. Existing metaphors give rise to new metaphors. The integrated transportation departments also increased the awareness of statewide systems. As a result of this awareness, the process of policy planning gave rise to two major issues and two major metaphors: the statewide highway system, the most important component among transportation modes, which is required for pursuing state goals, and the multi-modal system. On the metaphoric track these issues are shown in solid-line circles and are labeled as viewpoints. On the engineering track these same issues require modeling and studies and are shown in Figure 1 by broken circles. Without rigorous investigations by the engineering track the metaphoric viewpoints remain as metaphors about which we possess only general knowledge. On the other hand, if the dual planning tracks worked in tandem, the emerging metaphoric issues would be analyzed by rigorous investigations of the engineering track. Hence, as shown in Figure 1, new metaphoric viewpoints become major paradigms for the rigorous investigations track. The following three major components of the dual planning process constituted the main issues in the survey design of state DOTs:

- the scope of transportation policy planning,
- the statewide highway systems viewpoint, models and plans; and
- the multi-modal systems viewpoint, models, and planning procedures.

ANALYSIS OF SURVEY RESULTS

Of the 49 questionnaires mailed out, 43 state DOTs responded. Regarding Figure 1, the survey primarily addressed the paradigmatic-engineering track of planning and the analysis of the survey results. The survey results will concentrate primarily on three major issues: transportation policy planning, statewide highway system, and multi-modal systems planning. The analysis of each issue is presented in two parts: summary of survey results and the interpretation of these results. Conclusions will cover all three issues together.

Policy Planning

Survey Results

- In the 1970s, 16 states derived transportation policy recommendations from plans, and 8 states did not. In the 1980s, 23 states are anticipating policy alternatives to result from planning, 12 states are not, and 7 are in doubt.
- At the time of the survey, 18 states possessed a comprehensive state transportation policy plan and 19 states did not. Of the remaining states some looked on the existing transportation plan as a policy plan, others experienced problems in having the proposed policy plans accepted.
- Ten states possessed specific goals for their transportation plans in the 1970s, and this number increased to 32 in the 1980s.

Interpretation

The practice of utilizing plans for the promulgation of policy alternatives has been increasing. This is the old style of policy planning, however. Such a policy approach must be used in the absence of metaphoric policy designs. If a well-designed strategic planning were utilized for policy formulation, a comprehensive transportation policy could be developed primarily through physical and strategic planning.

In some states the goal strategy was consistent with the existing state policy, and it may be regarded as one of the means for pursuing state policy goals through planning. In other states, the goal strategy served as a surrogate for lacking policy. The increased usage of specific goals is one of the most significant characteristics of transportation planning in this decade. A specific goal is a force that shapes a specific

plan, such as statewide highway systems for state economic development.

Neither the increased use of goals for focusing transportation planning nor the increasing number of DOTs anticipating policies to surface from plans indicate the growth of a formal transportation policy design process. The fact that only 18 states possessed comprehensive transportation plans at the time of the survey suggests that the increasing number of goal-oriented planning is utilizing goals as a surrogate for the absence of explicit statewide policy plans. For major investments of resources, a comprehensive policy plan in most cases would identify a set of goals rather than a single goal.

Statewide Highway Planning

Survey Results

- Nineteen states are either considering updating or have updated the existing statewide plans prepared prior to the 1980s; 17 states prepared new statewide plans in the 1980s; 7 states have done no statewide planning. Of these, 14 have done statewide planning by regions, and 29 have been engaged in other types of planning.
- The gravity model has been used most commonly for trip distribution. The Federal Highway Administration's network loading programs have been favored in the 1970s and 1980s. However, the number of states altering and rewriting federal packages under different names has increased from 8 in the 1970s to 15 in the 1980s.

Interpretation

The use of planning tools during the last two decades indicates that the paradigmatic-engineering track of transportation planning produced no significant innovations in travel analysis techniques. Neither focusing on specific goals nor policy expectations from planning have required new analysis formulations.

The fact that 14 states have done statewide highway planning by regions and 29 states have been engaged in other types of planning by means of long-established tools and procedures indicates that the statewide highway systems metaphor remains only a metaphor. The system has not been redefined to reflect the commitment of DOTs for statewide multi-modal transportation management. The conceptions of such statewide systems range from a network of state level facilities as treated by Manheim and Neumann in their resource papers to the 1979 Conference on State Transportation Planning (*8*) to Creighton's suggestion that statewide highway planning has existed for at least 50 yrs (*7*), which implies the inclusion of most roads in the state. For the dual track planning process, transportation analysis would require a functionally stratified state road system, at the highest level of which would be included facility networks of state critical concern. The stratification would go a step further than the present functional classification practices and issues. The statewide highway system would have to be defined so that it could be analyzed independently as well as managed independently for upkeep, quality of services, hazard management, and future statewide transportation systems development. The system should be accessible to policy concerns: ". . . there is a general feeling that the issues emerging at the state level are of an order of magnitude more complex than urban, regional, or perhaps even national issues" (*9*).

Multi-Modal Systems Planning

The contradiction, which surfaced among the staff members in the internal evaluation of Florida DOT planning procedures, also reappeared in the survey of other state DOTs. This contradiction indicates a gap between expectations and the reality regarding statewide multi-modal transportation systems. The questionnaire asked the respondents, "what does the multi-modal concept mean to you?" and it provided several alternative answers ranging from a very high expectation to very low. The respondents were asked to indicate whether or not they agreed with the answers.

Survey Results

Question: What does the multi-modal concept mean to you? Answers:

- A potential for an integrated transportation system
  Yes (37) No (2)
- A coordinated system to the extent that it materializes as a result of observing economies and other inducements in making travel choices.
  Yes (34) No (1)
- An objective, but not implementable because of competing technologies and different ownerships.
  Yes (10) No (18)
- Just a concept with no practical relevance.
  Yes (2) No (28)

The performance of states with respect to multi-modal systems planning is as follows:

—20 states passed and 18 states did not pass legislation requiring multi-modal planning

—11 states have and 28 have not promulgated rules and procedures for coordinating multi-modal travel services

—16 states have and 24 have not considered preparing a simultaneous multi-modal study

—3 states possess and 40 do not possess manuals for multi-modal transportation studies.

Interpretation

The responses indicate an overwhelming belief in the multi-modal philosophy and all that the metaphor implies. This belief is indicated by 37 positive responses. The next characterization is also positive, but, instead of being categorical, it includes a play of factors that can influence the shaping of the system. The number of positive responses for this characterization dropped from 37 to 34. The third answer or characterization of beliefs includes potential obstacles for achieving an integrated multi-modal system. The concurrences with the answer dropped to 10 and the disagreements increased to 18. The negative view of the multi-modal systems received

only negligible support, namely 2, and the disagreements rose to 28.

The thrust toward creating multi-modal transportation systems, however, has been much less than the planners would have wished for. The fact that responses from 40 states indicated that no manuals have been prepared for this purpose raises an interesting question. Perhaps the evidence indicates that it did not make sense to prepare such manuals.

Referring to the dual track of transportation planning, the policy planning track is likely to confront a bottleneck at the stage at which the policy design addresses statewide highway and multi-modal systems. The paradigmatic engineering track is to explicate these supersystems and to turn the metaphors into knowledge of reality so that the systems could be subjected to strategic policy designs and rational management. However, as things stand now, the stage of strategic planning—where the decision makers, policy analysts, and engineers are to meet for strategic considerations of the overall transportation policy—the policy designers and engineers as yet have little to offer about the two supersystems. This condition stifles the progress of the dual track transportation planning.

CONCLUSIONS

The survey results indicate the need for modeling statewide transportation planning and policy making. Alternative approaches for initiating and organizing the two-track transportation planning are to become a paradigm of research and discussions at Transportation Research Board meetings and similar other research activities.

There is a need to return to the functional classification of highway facilities from which would emerge alternative models of a statewide highway system. The definition of statewide highway facilities network should be linked with the techniques for their analysis and management.

The multi-modal systems idea needs to be reassessed. The idea should stress new transportation technologies. Like commercial aviation, these technologies are to extend the travel parameters on the account of their innovations; competition with the automobile may not be the major issue in statewide multi-modal systems planning.

The points identified in this paper should be regarded as major issues of transportation planning of this and coming decades.

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Publication of this paper sponsored by Committee on Statewide Multimodal Transportation Planning.