MATCHING TRANSPORTATION PLANNING METHODS TO COPE WITH UNCERTAINTY

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INTRODUCTION

It is generally accepted that choice from among alternatives in transportation planning is the end-point of decision-making, where decision-making includes such activities as recognizing uncertainty in both means and ends. Therefore, it stands to reason that the following two variables are of importance in decision-making and policy formulation: (a) the degree of uncertainty attached to the goals and objectives of the project (ends) and the specificity with which these goals can be identified, and (b) the degree of uncertainty attached to the technology likely to be associated with the project for it to succeed (means).

Because of the uncertainty in both means and ends, one of the key characteristics of the future will be that transportation planners and their team-members will have to grapple with uncertainty, not only in dealing with new, unproven, and uncertain technology but also with highly complex organizations having fuzzy goals and objectives. If we consider three levels of the state-of-technological know-how, i.e., known, developing, and unknown, and connect these three levels with three degrees of uncertainty attached to the goals, i.e., certain, controversial and uncertain, we end up with a matrix of nine cells, each cell representing a situation, needing a unique or a combination of planning styles (see Fig. 1).

MEANS: TECHNOLOGY	ENDS: GOALS & OBJECTIVES		
	Certain	Controversial	Uncertain
Known	A	B	C
Developing	D	E	F
Unknown	G	H	I

The focus of this paper is to show that there are obviously different strategies, approaches, and styles relevant to each of the cells of this matrix, and that there are several varieties of organizational structures which facilitate these strategies.

1. THE NATURE OF TRANSPORTATION TECHNOLOGY

Profound advances in transportation technologies have occurred in the last decade, and these advances continue unabated. Because a great deal of transportation planning is concerned with the long-range future it is characterized by a high level of uncertainty. Also, transportation systems are highly capital intensive and, once built, are not easily amenable to major changes and rebuilding, without enormous expenditure and disruption. What do these basic facts mean in terms of planning for the future?

Planning processes, such as the rational planning model, were supposed to be used primarily to solve problems where both ends and means were pretty well known. This inherited professional legacy has led to serious dilemmas in recent years (Rittel and Webber, 1973; Friedman, 1987; Dzurik and Feldhaus, 1986). Given the great complexities that face planners and decision-makers with new transportation technologies emerging and multiplying, it is argued that effective planning and evaluation can best be undertaken if planners and decision-makers are cognizant of a variety of different planning styles available to them, to address a range of uncertainties occurring in transportation systems. The bottom line is that the problems of planning these systems, as they appear today, are highly complex, conflictual, and interconnected, involving multiple perspectives and assumptions. It is almost certain that these problems can never be truly solved, as some planners believe, but may possibly be resolved, following the law of the indestructibility of "wicked" problems (Rittel and Weber, 1973).

2. THE UNCERTAINTY MATRIX

As way back as 1959, Thomson and Tuden wrote a cogent paper on "Strategies, Structures and Processes of Organizational Decisions," attempting to demonstrate that there are several types of decisions in and on behalf of collective enterprises. Christensen (1985) and Khisty (1991, 1992) have modified and elaborated Thomson's ideas to reflect public policy issues. A description of Khisty's nine-cell "uncertainty matrix" follows:

Cell A: If a public agency agrees on what it wants and the technology to achieve this end is known and proven, then it is evident that certainty prevails and that the rational planning model (RPM) can be applied through standard, routine procedures. Limits to rationality, methodology, and professional expertise connected with the drawbacks of the RPM are compensated by its predictability, accountability, and effectiveness (Hart, 1986).

Cell B: When goals are controversial but the technology is known it is a case of "bounded" rationality as suggested by Simon (1976). "Satisficing" is the key word in this case, replacing the goal of maximizing or optimizing (Chadwick, 1971).

Cell C: With uncertain goals but known technology, consensus building can be established through communication, such as the Delphi or Brainstorming process or

even bargaining, partly guided from above by controlling societal groups and partly voluntaristic (Etzioni, 1968).

Cells D and E: The general approach to these two cells calls for incremental planning as suggested by Lindblom (1959, 1979), where adjustment, adjudication, and legitimization are applied.

Cell F: This is a case where adversial relationships are common and where "advocacy planning" could be considered. The ideal role of the advocate is to assist the client organization in clarifying its ideas and goals, resulting in acceptable steps in planning (Davidoff, 1965).

Cell G: When the goals are certain but the technology is unknown, experimentation is the name of the game and this may lead to possible innovation. Fuzzy technology can often be applied in a relatively small pilot project, with the intent of figuring out the sensitivity of the various parameters entering the system.

Cell H: To the majority of "rational" planners this cell, with controversial goals and unknown technology, may represent a case of "near chaos." However, radical planners believe that education comes from social learning and "reflection-in-action" (RIA), popularized by Schön and his colleagues. RIA is an improvisational problem-solving, interactive experimentation, undertaken on the spot, using local knowledge and has proved successful in recent years (Schön, 1971, 1982, 1983).

Cell I: This is truly a chaotic situation, particularly when an organization does not have a leader. Rittel and Weber (1973) have addressed this and other situations explaining some of the characteristics of "wicked" problems.

The nine cells described above should by no means be considered as water-tight compartments. Combinations of planning strategies and styles is the answer. As controversy and uncertainty increase it is inevitable that the planning process will grow more complex.

3. DISCUSSION

Uncertainty appears to be the dominant characteristic facing most planning organizations now, and will be more intensive in the future. Depending on the chemistry of the situation, a range of planning-solving approaches and styles need to be adopted by planners. The different approaches suggested in the last section, envisions the planner as neither the pure technician nor the value-free implementor of decisions made by others. In fact, the complexity of emerging problems places transportation planners at the crossroads of engineering, planning, and socio-politics, and much will therefore depend on their ability to integrate and apply the principles of planning theory in day-to-day practice (Schon, 1983).

Radford (1977) has suggested four broad specifications for dealing with such complex decision-making:

a) the decision-making procedure should include the most appropriate characteristics of existing approaches developed in the analytical, behavioral, and political sciences;
b) it should be readily comprehended by the public;
c) it should be sufficiently broad-based and flexible for application in a wide range of problem situations;
d) it should be one that can be introduced unobtrusively into an agency, with a minimum amount of disruption.

In recent years planners have made deliberate effort toward development of a "contingency" role in practicing their profession. They have changed their strategies to suit the situation, and have realized in no uncertain terms that political concerns generally take precedence over technical concerns for all but the most simple situations (Bryson and Delbecq, 1973).

Schon's concepts of reflection-in-action have also gained recognition, particularly in those fuzzy areas of planning where the situation appears chaotic. Ideas of moving from the hard, high, ground of the theorist to the dark, messy, boggy swamp below of the practitioner, are gaining momentum (Khisty and Khisty, 1991).

In the last decade, some radical changes have been initiated by several notable planners all across the world who are trying to grapple with problems quite similar to what is occurring in transportation planning. Of particular interest, is the work of Checkland, whose published literature focuses on the approach to plural rationality through "soft" systems methodology. As opposed to "hard" systems methodology (similar in many respects to RPM) which is used for tackling real-world problems where an objective or end-to-be-achieved can be taken as given, "soft" systems methodology, based on a phenomenological stance tackles real-world problems in which know-to-be-desirable ends cannot be taken as given. Checkland's methods have been applied with much success in scores of planning and management situations around the world (Checkland, 1981, 1985).

And lastly, there is the question of citizen participation. The involvement of citizens in the governing of society is the subject of history itself. In the span of the last 40 years, the level and the effectiveness of citizen participation in the planning process has most often been stimulated and enhanced when existing social problems are complicated and the level of uncertainty is high. Such enhancement is also observed when the citizenry is skeptical of official solutions. It is therefore anticipated that as the planning process grows more complex, active citizen participation and control will become common place, thus ensuring that bureaucracies are responsive to the public they serve. Ultimately, all plans are really political statements; indeed, all attempts to implement them are political acts (Rondinelli, 1983).

4. AGENDA FOR AGENCY BUILDING

If there is one nagging theme that haunts us through our discussion on planning, it is that of rationality. The bottom line is that in attempting to be rational do we really make things better or worse? The complexities of planning forces planners to view problem-solving as a process of social interaction, trial and error, successive approximation, and social learning. Such an approach induces planning institutions and agencies to move away from the Weberian model (Friedman, 1987).

Under the circumstances it is very likely that transportation planning agencies will be obligated to reconstitute and restructure their organizations to adopt some or all of the following characteristics:

a) technical capability: the ability of agencies to deliver technical services and sift through "technical know-how" for guiding society regarding technical innovations and possible adoption;
b) normative commitment: the ability of agencies to internalize innovative ideas and practices for the betterment of society;

c) environmental image: the ability of agencies to attain favorable recognition from society, on the basis that they respect environmental concerns, when adopting innovative ideas.

d) equity concerns: the ability of agencies to effectively address questions of equity, at both the micro and macro level. Distributive justice is as important as the adoption of new technology;

e) citizen participation: the ability to effectively engage the participation of system members in contributing to the collective knowledge of the system. The more complex the problem, the greater is the need for localized solutions and value innovations--both of which call for broadly-based citizen involvement in the decision process.

f) accountability: the ability of agencies to recognize that under conditions of uncertainty, errors and mistakes are not only likely, they are to be expected. The concept of policy-making as social experimentation requires that planning and implementation of a project be carried out in such a way that errors and mistakes can be uncovered as the project proceeds. It can then be redesigned and revised incrementally. This point is highly significant because planning agencies are notorious for suppressing mistakes and errors and have been known to punish managers, sometimes wrongly. Fear of making mistakes discourages correction, redesign and redirection and inhibits creativity, innovation, flexibility, and experimentation, the very core of successful planning and implementation.

5. CONCLUSIONS

Traditionally, transportation planning has assumed that both the technology to be adopted and the goals and objectives set forth by an agency are well known, in which case the rational planning model is well suited for application. Although this assumption is theoretically true, the real world does not operate in this tidy way. With the tremendous strides made in almost every area of transportation technology, such as electronic guidance systems, automatic vehicle control, and communication science, transportation planners and decision-makers are faced with the dilemma of dealing with technology that is constantly in transition. Coupled with this problem is the one connected with goal formation and adoption. Uncertainty in both dimensions of the matrix--means and ends--is difficult to comprehend. However, this is a fact that is going to become increasingly prevalent in more and more transportation planning agencies. Planners and decision-makers will have to face this uncertainty by tailoring the planning process according to the degree of uncertainty embedded in the technological knowledge base and the goals adopted.

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