

## THE SIGNIFICANCE AND METHODOLOGY OF PROBLEM STRUCTURING IN PUBLIC POLICY MAKING

Seon-Ho Kim  
Dept. of Public Administration

### <Abstract>

In current policy making, with the myriad of special interest groups at all levels and the constant competition for limited resources, the problem structuring at all stages of policy making does occur. Various stakeholder groups define a common problematic situation in different and often opposing ways. These same interest groups employ diverse analysts to generate alternatives and then apply diverse methods to assess these alternatives. In the positivist tradition, a problem is simply defined and a procedure is implemented to determine goals or objectives, generate alternatives, evaluate the alternatives and their impacts and finally choose the best alternative. However, the post-positivistic approach stresses the goal of defining the problem by abstracting and integrating various possible conceptions out of the problematic situation, and then applying social science procedures to evaluate various alternatives and ultimately choose the best policy for implementation. Many believe that the most critical aspect of policy making and policy analysis is problem structuring because many of the most important policy problems are ill-structured. An appropriate theory of policy analysis should not only contribute to improved formulations of a problem; it should also reduce the probability of errors that result from answering the wrong policy question. This paper identifies the major source of error in problem structuring, i.e., type III errors, and discusses methods and techniques that attempt to avoid type III errors.

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### 公共政策決定에 있어서 問題構造化의 重要性和 方法

김선호  
행정학과

## <요 약>

모든 계층의 수많은 이해집단이 제한된 자원에 대하여 끊임없는 경쟁을 벌이고 있는 정책결정상황하에서 문제의 구조화는 정책결정의 모든 단계에서 이루어지고 있다. 다양한 이해관계집단은 같은 문제상황을 다르게 그리고 흔히 대립되게 정의하고 있고 분석가를 동원하여 대안을 만들고 대안평가를 위하여 다양한 방법을 적용하고 있다. 실증주의적 전통에 있어서는 문제가 먼저 정의되고 목표가 결정되면 그에 대한 대안이 마련되고 각 대안과 그 영향에 대한 평가가 이루어지고 마지막으로 최선의 대안이 선택된다. 그러나 후기실증주의적 접근법에서는 문제에 대한 정의를 강조함으로써 문제상황으로부터 다양하고 가능한 모든 개념을 추상화하고 통합하고 그 다음 여러 대안을 평가하기 위한 사회과학적 절차를 적용하여 궁극적으로 집행을 위한 최선의 정책을 선택하게 된다. 많은 사람들은 대부분의 중요한 정책들이 구조화가 잘 되어 있지 않다고 믿고 있기 때문에 정책결정과 정책분석의 가장 중요한 측면은 문제의 구조화라고 생각하고 있다. 따라서 정책분석이론은 보다 향상된 문제형성에 기여를 해야 할 뿐만 아니라 틀린 문제를 풀게 됨으로써 발생하는 오류를 감소시켜야 한다. 본 논문은 문제의 구조화에 있어서 제3종오류의 원천을 식별하고 감소시키기 위한 방법을 논한다.

## 1. Introduction

Many of the most important policy problems are messy(Ackoff, 1974) or ill-structured(Simon, 1973; Mitroff and Mason, 1981). In contrast to the well-structured problems depicted in many texts in decision theory, ill-structured problems are those which typically involve many decision makers whose identity and perspectives of a problem cannot be specified and policy alternatives and their outcomes may be unknown, such that estimates of risk and uncertainty are not possible(Dunn, 1981). Under these conditions, it makes no sense to solve a problem, since a severe deficit of information makes it impossible even to diagnose a problem whose existence is itself in question. Dunn defines the policy process as "The administrative, organizational, and political activities and attitudes that shape policy outputs and impacts" (1981:333). Inherent in this definition are numerous decisions regarding the policy-making process. These decisions involve a multitude of actors and stakeholders that enter into policy debates with multiple frames of reference and carrying various claims to knowledge. Because of the complexity of the policy process milieu, problems of incomplete information, uncertainty, and ambiguity in public policy making emerge.

In the problem structuring process one critical component is information. Reputations for organizational intelligence are built on capabilities for securing, analyzing, and retrieving information in a timely and intelligent manner(Weilenmann, 1980). Various research such as information processing interpretation of cognition, economic theories of information, and cybernetic perspectives on adaptation all build on the idea that information processing is a vital aspect of human behavior.

In public policy making, information is frequently inadequate, or simply not available, partially due to constraints of time and events. When the issue is that of portraying particular facts and describing particular state of affairs, there can be no question that policy makers always leave something out. The policy makers' information about his environment is much less than an approximation of the real environment (Simon, 1983: 342). They cannot describe the world completely. The task is too big in principle; the domain of relevant information is too large for descriptive completeness. The ability to choose an action in a complex decision situation is severely restricted by his limited information-handling capability. The relatively low capacity of the human sensory channels limits his ability to perceive the current state of the environment and his information storage is slow and unreliable.

The concept of uncertainty has been defined in a variety of ways. Lawrence and Lorsch (1967: 27) state that uncertainty consists of three components: 1) the lack of clarity of information, 2) the long time span of definitive feedback, and 3) the general uncertainty of causal relationship. Policy makers tend to believe that events are related causally and thus try to infer the causal relationships underlying these events and the actions of other actors.

Because policy makers depend on a limited repertoire of responses, they often attempt to place a novel event or series of events into the context of their experiences (Scheidell, 1974). One context is that discussed by Allison (1969) in terms of standard operating procedures. Another is the policy maker's cognitive style (Blaylock and Rees, 1984). This evidence suggests multiple conceptualizations leading to conflicting definitions. The policy makers go through a process that involves observation, assessment, and abstraction from reality. Since different individuals involved perceive the same reality differently, the heterogeneity of values, images and perspectives can be brought to bear on policy making. This results in sharp definitional conflicts. In light of the diversity of values and value structure, it is difficult, if not impossible, for the decider subsystem to reduce the variety of the competing values and interests (Weilenmann, 1980), for example, the controversy surrounding the definition of risk.

The choice of definition can affect the outcome of policy debates (Fishhoff, et al, 1984). Most policy problems are ill structured (Ackoff, 1974; Churchman, 1979; Mitroff and Emshoff, 1974); they are structured with ambiguity and uncertainty. The problems can be seen in quite different ways (ambiguity), depending on the viewer's personal characteristics, loyalties, past experiences, and even on accidental circumstances of involvement. There is no single correct view of the problem.

Goals change over time in unpredictable ways; preferences are ambiguous; conflicting motivations for action arise from the existence of independent sources, such as self-interest, morality, tastes, and a variety of unblended social roles. Clear specification and even recognition of goals are disadvantageous, since clarity can lead to conflict, so that ambiguity is intelligently preferred. Ambiguity about preferences is an implicit acknowledgement of the difficulty of guessing future desires. Thus ambiguity allows preferences to develop. The purpose of this paper is to elaborate

those conditions, processes, and strategies that lead policy analysts to structure policy problems.

## 2. Significance of Problem Structuring

The significance of studying problem structuring in policy analysis has been recognized by many scholars (Dunn, 1981; Quade, 1975; Caplan, 1977). Policy makers are confronted with situations where there is little or no agreement on the nature of the problem itself, since the process of formulation itself is an individual cognitive process concerned with the description and design of knowledge. The processes of knowledge production and utilization raise questions about the different meanings of rationality, since rationality is not simply a matter of finding an adequate formal definition of a problematic situation (Dunn, 1981). Different persons use different constructs to understand the same reality (Kelly, 1955). These personal constructs lead to varied perceptions and interpretations of the same event. A number of difficulties arise in defining the nature of the problem itself (i.e., defining problem boundaries, assessing the scope of problematic situations, assessing factual or cause and effect components of certain problem definitions, unpacking a problem definition from rhetorically defined issues, etc.) (Bardach, 1981).

In public policy making, policy intervention is proposed to alter some existing circumstance or mode of conduct. Any policy proposal contains assertions whose reasoning may be done by "if-then" hypothetical deductions, or by other reasoning methods. However, their truth value has not been determined. All policies carry with them some probability of significant error and therefore cannot be accepted as correct a priori. The selection of a course of action is a function of knowledge - a knowledge of causation, and is rather similar to the selection of a therapy. The diagnosis (definition or structuring of problem) may be correct, but the therapy (a course of action) may be wrong, or the therapy may be correct, but the diagnosis may be wrong.

## 3. The Source of Type III Error in Problem Structuring

Problem structuring in policy analysis is conceived as a process with three phases: the recognition or felt existence of a problematic situation (sensing), moving from a problematic situation to a substantive problem through problem conceptualization, and making a formal problem through problem specification (Dunn, 1981; Mitroff and Kilman, 1978). Modelling then becomes the transformation that converts the ill-structured nature of the problem into a more structured one capable of precise definition, hypothesis formation, and hypothesis testing.

Each of these phases results in the production of information concerning the problematic situations, substantive problems, and formal problems. However, the

unconscious or uncritical choice of a world view, ideology, frame of reference, or myth may seriously distort the conceptualization of a substantive problem and its potential solutions (Dunn, 1981, 110). Policy analysts fail more often because they solve wrong problems rather than because they get the wrong solution to the right problem. The fatal error in policy analysis is solving the wrong formulation of a problem when one should have solved the right one. Errors which result from answering the wrong policy question have been designated as Type III errors by Kimball (1957), Raiffa (1968) and Mitroff and Betz (1972), as contrasted with calibrational errors which occur when one sets confidence limits too high (Type I error) or too low (Type II error) in testing null hypothesis. Type III errors or their equivalent have been reviewed by Adams (1974), Watzlawick, Weakland and Fisch (1974) and Fischhoff (1977) in a wide variety of policy issue areas. To minimize and control for type I and type II error at the expense of type III error is to commit the fallacy of misplaced precision (Mitroff and Featheringham, 1974).

There are three commonly recognized situations in which one is likely to commit a type III error: 1) when one chooses the wrong boundaries of the metaproblem, 2) when one chooses the wrong world view, ideology, or myth to conceptualize a problem situation when one should have chosen the right one, and 3) when one chooses the wrong formal representation of the substantive problem when the right one should have been chosen (Dunn, 1994: 151). In these cases, the chances of committing the error are present.

One of the most important determinants of a problem's solution is how that problem has been represented or formulated in the first place (Churchman, 1971; Mitroff & Sagasti, 1973; Ackoff & Emery, 1972). Indeed, the initial representation or conceptualization of a problem is crucial to its subsequent treatment. Research on decision making (Kahneman, Slovic and Tversky, 1982) and problem solving (Newell and Simon, 1972; Keren, 1984) emphasizes the importance of representation or problem space. Decision maker's representation of the task environment permits the consideration of different problem situations and sets limitations on possible operations that can be applied to a given problem.

The process of representation and the factors that affect it are of major importance in judgment and choice (Newell and Simon, 1972: 57). People use relatively simple judgmental heuristics that often lead to false assessments. Tversky and Kahneman (1974), for example, have uncovered several cognitive "faults" related to the common use of the representativeness and availability of heuristics. People tend to make false estimates because they fasten on available data rather than questioning the data generation process. They tend to focus on current information while neglecting prior information. When irrelevant information is made available, they tend to believe it is representative.

A policy problem refers to those elements of a system of conditions which produce dissatisfaction (Dunn, 1981). Therefore, a problem is perceived when a discrepancy or gap is perceived between the existing state (perceived reality, initial state) and a desired state (goal, standard of how things should be, terminal state) (MacCrimmon &

Taylor, 1976; Simon, 1977). Here, we need indicators to sense the problematic situation. Unfortunately, we do not have such indicators that maximize the probability of discerning an important problem that actually does exist. Due to the complexity of information and rigidities in belief and perception, such indicators often lead to conflictual conceptualizations of problems. According to Gioia and Poole(1984), organizational members are held to retain schema based knowledge("scripts") of behavior and behavior sequences appropriate to specific organizational situations and contexts. This script notion is not competing with other concepts like roles, habits, modeling, and frames, but rather complements or provides added explanatory dimensions to them.

#### 4. The Nature of Policy Problem

As indicated earlier, type III errors occur when we transform whole systems of problems into a wrong substantive problem through problem conceptualization and when we choose the wrong formal representation of the substantive problem. In order to more succinctly understand why policy analysts make errors when they provide the wrong substantive or formal representation of the original problematic situation, we must, first, understand the types and characteristics of policy problem.

Policy problems have been classified into three broad groups(well structured, moderately structured, ill structured) based on their relative structural complexity of system of problems(Dunn, 1981: 103; Mitroff & Sagati, 1973). Well structured problems involve one or a few decision maker(s), a limited number of alternatives, and consensus on utilities. Thus, the definition of problem can be consensually approved. Conversely, ill structured problems involve many decision makers, conflicts of values, and unlimited number of alternatives. What differentiates ill structured problems from well structured problems is a lack of good information about their existence, nature, and solution.

Many policy problems belong to the realm of ill structured problems characterized by ambiguity and imprecision. Also, the concept of complexity is closely intertwined with the idea of the structure of policy problems. First, policy problems are interdependent. No problem exists in complete isolation(Ackoff, 1974: 21). Problems in one area frequently affect policy problems in other areas. For example, an energy problem is related with the cost of manufacturing, which is also related to foreign competition. Second, policy problems are conceptual(Ackoff, 1974) and subjective constructs because the external conditions that give rise to a problem are selectively defined, classified, explained, and then conceptualized. Third, policy problems are artificial in the sense that they are possible only when human beings make judgments about the desirability of altering some problematic situation. Fourth, policy problems are dynamic in the sense that problems and solutions are constantly changing.

The fact that policy problems are characterized by subjectivity and artificiality, because they are structured through subjective judgment and conceptualization, is

relevant to the type III errors in policy analysis. That is, the same problem can be viewed in radically different ways by alternative subjective understandings and interpretations regarding the fact, the problem to be dealt with, and the choice of alternatives (Allison, 1969). That is why a study of problem structuring takes into consideration the personalities (Mitroff and Kilmann, 1978), the styles of inquiry (Churchman, 1971), world views (Conover & Feldman, 1984), and the preferences for certain types of problems that policy makers bring to the tasks associated with problem solving.

## 5. Methodologies of Problem Structuring

Churchman's (1971) five models for inquirers (Leibnizian, Lockean, Kantian, Hegelian, and Singerian) is appropriate for examining problem structuring methodologies. The rational comprehensive approach (Dror, 1971) is an application of a Leibnizian inquiry system because of its emphasis on the logical, mathematical, and purely formal analysis of all possible courses of action in order to choose the maximally effective way to deal with a problem which has been well-structured.

The incremental approach (Lindblom, 1959) to problem structuring bears the characteristics of a Lockean inquirer with its emphasis on reality and consensus. The mixed scanning approach (Etzioni, 1967) to problem structuring is very much Kantian way of interrelating these rational and incremental approaches.

A dialectical approach (Mitroff, 1974; Mitroff and Emshoff, 1978) is an application of a Hegelian inquiry system because of its emphasis on constructing conflicting views about the problematic situation. Dialectical inquiry involves three major steps: an initial assessment to determine the issues and arguments for a structured debate; a structured debate to formalize and clarify the positions; and an argumentation analysis to determine the positive, neutral, or negative view associated with each argument, together with a plausibility review and the formulation of subsequent recommendations.

A general system approach (Bertalanffy, 1968; Weilenmann, 1980) to problem structuring is very much a Singerian mode of inquiry since it continually reviews conceptualizations of the problematic situations and investigates the isomorphy of concepts and models of the other inquirers. Therefore, it minimizes the duplication of theoretical efforts in different fields and promotes the unity of science through improving communications among specialists. In its broadest sense, general systems theory is a supradiscipline, including such special system disciplines as mathematical system theory, system engineering, cybernetics, control theory, and automata theory. But a extremely important practical point in the application of systems concept is the difficulty of defining systems, subsystems, boundaries, steering mechanisms, etc. Therefore, the systems approach of Ackoff calls attention to the subjective views men have of the system.

Closely related to these methodologies of problem structuring mentioned above are approaches for organizational learning (Argyris and Schoen, 1978; Cyert and March,

1963). These approaches are based upon notions of assumption surfacing, sharing world views, and the like.

Organizational learning was addressed by Cyert and March(1963) as a process by which organizations as collectives learn through interaction with their environments. Environmental responses are interpreted by individuals who learn by updating their beliefs about cause-effect(i.e., action-response) relationships. Members of the organization share information, creating organizational memory in the form of shared beliefs, assumptions, and norms(Argyris and Schoen, 1978). This organizational memory, then, guides individual and organizational actions. Thus, organizational learning is the means by which knowledge is preserved so that it can be used by individuals. Also, Simon(1969) defined organizational learning as the growing insights and successful restructurings of organizational problems by individuals reflected in the structural elements and outcomes of the organization itself. This definition contains the development of insights and implies a change in states of knowledge.

Understanding the nature of organizational learning is critical to our understanding of how organizations process policy relevant information. Learning strengthens a capacity to make connections among different values because the process of policy reasoning is differentiation(the number of separate considerations brought to bear in deriving a policy preference) and integration(the extent to which these antecedent considerations are themselves interrelated)(Sniderman, Brody & Kuklinski, 1984). Capacity of inferential reasoning can be regarded as collecting and combining often diverse and complex information into judgment(Fiske and Taylor, 1984: 283).

As Etheridge(1983) pointed out, the change of governmental learning might be assessed when people in government have increased capacity for differentiation, increased capacity for organization and hierarchical integration, and increased capacity for reflective thought. Organizational learning occurs when individuals, acting from their images and maps, detect a match or mismatch of outcomes to expectation which confirms or disconfirms organizational "theory-in-use"(Argyris and Scheon, 1978; Argyris, 1982).

Single-loop learning involves keeping the organizational performance at acceptable levels, within a given set of organizational goals and constraints, and error correction proceeds by changing organizational strategies. It maintains the central features of an organization's "theory-in-use" or set of rules and restricts itself to detecting and correcting errors within that given system of rules. Double-loop learning, on the other hand, involves restructuring organizational norms, and restructuring strategies and assumptions associated with those norms. It involves fundamental changes in frame of reference or theories-in-use prevailing in organization. The associations that result from double-loop learning have long term effects and impacts on the organization as a whole. This type of learning occurs through the use of heuristics, skill development, and insights. It therefore is a more cognitive process than is single-loop learning, which often is the result of repetitive behavior. The context for double-loop learning typically is ambiguous and ill-defined, making purely repetitive behavior rather meaningless. This ambiguity and environmental complexity characterizes policy maker



levels where decision making norms are at least partially determined, that is, where double-loop learning usually occurs. Some type of crisis is necessary for changes in double-loop learning (Miller and Friesen, 1980).

Information or knowledge use, which has been the focus in the policy literature (Caplan, 1976, 1977; Dunn, 1980, 1982; Rich, 1977) could be relevant with constructs from organizational learning theory such as information acquisition, distribution, interpretation, and memory. Various knowledge utilization models in public policy making are suggested.

The engineering model suggests that applied social science involved using insights of basic social science theory, together with rigorous methods to tackle the problems. In this model, the task of basic researchers is to develop and test a logico-deductive system of hypotheses and propositions. This model is linear one. That is, a problem exists; information or understanding is lacking either to generate a solution to the problem or to select among alternative solutions; research provide the missing knowledge; and solution is reached. However, this model fails to address the false analogy between social and natural sciences (Dunn, 1980).

The enlightenment model (Caplan, 1976; Knorr, 1977; Janowitz, 1972) assumes the importance of social context, and focuses on developing various types of knowledge that can be utilized by policy makers. Weiss (1977) suggested that social science knowledge may be used to help conceptualize problems differently rather than as direct input into specific decisions. However, the enlightenment model gives little attention to the problem of utilizing the findings of research because policy makers are likely to adopt an engineering approach in which a problem is specified, and this model neglects the dynamics of influence receptivity diad.

The problem solving model suggests that policy makers can search the preexisting research for assistance in formulating and considering problems. The major responsibility of policy researchers is the identification and analysis of the appropriate means to achieve the agreed upon goal. This model assumes the following sequence of events: 1) definition of pending decision, 2) identification of missing knowledge, 3) acquisition of social science research, 4) interpretation of the research for the decision context, 5) policy choices (Weiss, 1979: 427). One assumption in this model is that there is a consensus on goals. Policy makers and researchers tend to agree on what the desired end state should be. The main contribution of social science research, therefore, is to help identify and select appropriate means to reach goals. However, this model can discourage researchers when events do not occur through the sequential stage.

Unlike linear models of knowledge utilization, interactive models propose a set of reciprocal relations between policy makers and researchers. Both researchers and policy makers communicate and pool their efforts and knowledge in an attempt to tackle a particular problem (Weiss, 1977: 14). In this model, the use of research is only part of a complicated process that also uses experience, political insight, pressure, social technologies, and judgment. It has applicability not only to face-to-face settings but also to the multiple ways in which intelligence gathered through intermediaries and

brought to bear. The notion that more and better contact may result in improved understanding and greater utilization may be plausible, but there are also conditions where familiarity might well breed contempt rather than admiration.

The utilization of research-based and experiential knowledge require the communication of a body of knowledge. However, there are many barriers to the knowledge transfer or utilization process. Perhaps the expectation that social research could ever produce indisputable knowledge is rather naive. To couple existing knowledge and the production of new knowledge to meet policy makers' needs require collaborative arrangements which must be congruent with the nature of the utilization problem and the existing system of inquiry used to acquire and process information. Effective linking mechanisms depend upon the nature of the policy problem and context in which utilization embedded. Holzner(1979) calls attention to the need for understanding the multiple frame of reference of those actors involved in public policy making. These differences in attitudes, frame of references, and orientation are an important component of the problems and difficulties that policy makers and researchers have in interacting with each other. Both communities often look at the same data about a same phenomenon, but ask different questions, arrive at different answers, and have entirely different set of priorities in proposing solutions.

In effect, the frames of reference of policy makers contain their experientially grounded theories-in-use(Zaltman, 1977). Also, cognitive styles of policy makers affect the way one acquires knowledge relevant to specific policy problems(Scarpio, Dunn and Mitroff, 1983). The degree of receptivity for a particular type of knowledge is the result of the influence of knowledge on society. Those diverse assumptions in society are organized in frames of reference. Reality tests(Holzner and Marx, 1979: 103-11) are key components of a frame of reference because they validate knowledge and the process of inquiry according to shared, social, and cultural experiences. Dunn(1980), for example, provided the five contingency models(product contingent, inquiry contingent, problem-contingent, structure contingent, and process contingent) which identified the key factors determining the utilization of research information in public policy making, as one explanatory model. The lack of support for the problem contingent and inquiry contingent hypotheses provide some promise for the conflicting world view version of the two community theory.

Given this subjectivity, the strategies for improvement of knowledge use must be holistic. Dunn(1983) suggests qualitative methodology which focuses on the subjective dimensions of knowledge creation, dissemination, and utilization. They are: case analysis, ethnography, ethnomethodology, etiograph, grid technique, Q technique and strategic assumption surfacing and testing.

## **6. Methods and Techniques for Avoiding Type III Errors**

In ill-structured problems it is clearly impossible to reach an optimum solution (Strauch, 1976). We can only try to improve the quality of solutions by insuring

efficient utilization of methods and attempting to achieve optimal solutions. Many problems are hard to formulate because they involve conflicts of interest which produce conflicts in problem statements. The solutions to most ill-structured require the use of non-programmable procedures and the creativity of policy analysts(Dunn, 1981). The ability of models to answer predictive questions is largely a function of their success in accurately capturing why the world works as it does. Simple extrapolation, moving average, or Box-Jenkins models may do a credible job in forecasting by conventional goodness-of-fit criteria and yet give us no help in knowing how to intervene in the systems of mess.

A number of methods and techniques have been recommended because of the inadequacy of standard formulation of policy problems and the necessity of novel formulation. Most techniques are group-based(argumentation analysis, brainstorming, policy grid, and policy delphi), a few are individual based(classification analysis, hierarchy analysis, and synectics). Especially, argumentation analysis(Toulmin, et al., 1979) identifies the statements taken as given positions(i.e. facts or data), the warrant(the assumptions used to interpret the givens as support for a conclusion) and the rebuttals(the conditions under which the conclusion does not follow). One of the main functions of the rebuttal is to help qualify the argument and to assess its plausibility. Rebuttals play a key role in assessing the plausibility of an argument.

Brainstorming techniques(Osborn, 1948) are basically unstructured processes, face-to-face interactions, and the time-honored through mundane-sounding practice of circulating reports authored by one individual and commented on, or cleared, by others. These techniques provide speedy, inexpensive, highly interactive means of interesting opinion. They do not, however, address either the problem of face-to-face intimidation and group-think(that is, individuals tend to agree with domineering or high-ranked individuals, or they dismiss considerations that run counter to the group's consensus in order to facilitate positive social relationships with the group)(Janis, 1972).

The success of problem structuring depends to a great extent on the ability of understanding and representing the causal relationships in problem domain. Cognitive mapping is a set of techniques for studying and recording people's perceptions of the world around them. A cause map, a special type of cognitive map, is built by connecting concepts to each other by arrows. Many cognitive mapping techniques(Axlerod, 1976; Bougon, et al., 1977; Eden, et al., 1992) consist of three major steps: 1) eliciting concepts, 2) refining concepts, and 3) identifying assertions that concepts are connected by causal relationships. Concepts represent the perceptions of complexity of the problem. The comprehensiveness of the identified concepts demonstrates the effectiveness of the activity for achieving the objective of eliciting concepts. Identifying categories is part of the concept refinement process of the cognitive mapping techniques. Determination of individual categories can be accomplished using content analysis. Determination of the relative importance of the categories is another refinement step in cognitive mapping procedures. The final component required to derive a cause map of perception of problem complexity is the relationships between categories.

The analytic hierarchy process(AHP)(Saaty, 1980, 1982) has been regarded as a useful method for solving prioritization problems. It has been widely used in different types of decision problems. This method can convert subjective assessments of relative importance into a linear set of weights, which can then be used to rank alternatives. AHP enables us to consider a problem as a whole and to study the simultaneous interaction of its components within a hierarchy. AHP organizes the basic rationality by breaking down a problem into its smaller constituents and then call for pairwise comparison judgments to develop priorities. Having established the priorities, the next step is to obtain the measure of the relative performance of each available alternative problem formulation.

On formulating strategic problems, Ramaprasad and Mitroff(1984) developed a model of logico-mathematical structure(LMS) based on the relationship between Jungian personality typology(Jung, 1924) and Piaget's model of development of LMS(Piaget, 1974). Also, Simon(1981) and Lenat(1983) give us the concept of a heuristics which attempts to solve a priori ill-structured problems more efficiently.

## 7. Conclusion

The prevalence of Type III errors in public policy making requires the need for appropriate search procedures that enable us to structure problems in the course of solving them. Although many such methodologies have been proposed, few of these attempt to deal systematically with ill-structured problems. Proponents of problem structuring methodologies designated as "dialectical" (e.g., Mitroff and Mason, 1981; Rein and White, 1977) are virtually alone in developing decision procedures which are uniquely appropriate for ill-structured problems. Just as basic social research demands that quantitative methods be combined with the qualitative methods(e.g., participant observation, and historical analysis), in the methodology of problem structuring we too need to combine a variety of methods and techniques aimed at our substantive goal of successful analysis. I think only way to reduce error and encourage policy innovations is to institutionalize "ethical analysis"(Dunn, 1983) in government policy making in order to encourage "negative feedback" and "deviation amplification". If ethical analysis in public policy making is shuned, as Amy(1984) pointed out, because it frequently threatens the professional and political interests, capacities for good judgment or government learning will not be achieved in designing of good public programs. In current policy making, with the myriad of special interest groups at all levels and the constant competition for limited resources, the problem structuring at all stages of policy making does occur. Various stakeholder groups define a common problematic situation in different and often opposing ways. These same interest groups employ diverse analysts to generate alternatives and then apply diverse methods to assess these alternatives. The role of the policy maker in this context is to integrate and then interpret this multitude of information to recommend a plausible policy to solve the problem. The active construction of problems by stakeholders brings the

challenge for the policy analyst to deal with the complexity arising from the diverse construction of problems. Here, the role of policy analyst is to orchestrate the various stakeholders' analyses into a final problem structuring exercise to assist the policy maker. By integrating the stakeholders' analyses, this analyst expands the policy maker's requisite variety and ultimately reduces the probability of error of the third kind.

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