SOCIAL JUDGMENT THEORY: APPLICATIONS IN POLICY FORMATION

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Kenneth R. Hammond, John Rohrbaugh,
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HUMAN JUDGMENT and DECISION PROCESSES in APPLIED SETTINGS

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I. SOCIAL JUDGMENT THEORY: APPLICATIONS IN POLICY FORMATION

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Judgment and decision making play a pervasive role in human affairs. Nowhere is the role of human judgment more critical, however, than in the formation of social policy. Policy decisions by government agencies, legislative bodies, and corporate organizations profoundly affect the lives of us all. Moreover, the problems confronting policymakers are rarely easy. Policy problems are ordinarily complex, often ill-defined, and usually lacking clear criteria by which to ascertain the quality of alternative decisions.

The urgent need for new and better methods for improving the ability of policymakers to deal with these difficult problems has been widely recognized (e.g., Bauer & Gergen, 1968; Dror, 1971a, 1971b; Lasswell, 1951). One potential source of assistance for policymakers is in the work of psychologists who study human judgment and decision processes. The approaches taken by several students of human judgment are presented in Kaplan and Schwartz (1975). The present chapter describes the application of one approach, Social Judgment Theory (SJT), to a series of problems outside the laboratory. Although the theoretical principles and empirical findings that support these applications are described in detail by Hammond, Stewart, Brehmer, and Steinmann (1975) in the Kaplan and Schwartz volume, a brief description of SJT precedes the discussion of these applications.

A DESCRIPTION OF SOCIAL JUDGMENT THEORY

A DIFFERENT APPROACH TO APPLICATION

Tradition has it that application proceeds from basic research. Once fundamental questions are answered in the laboratory, then knowledge gained in its pure, basic form can be applied in the world outside the laboratory. This strategy, however, has seldom proved successful for psychology and other social sciences. According to SJT, the primary reason for the failure of basic research to provide useful applications is that psychologists, including students of human judgment, have traditionally failed to pay adequate attention to the complex nature of the environment outside the laboratory (see Rittel & Webber, 1973 for a discussion of the environmental complexity that confronts public policymakers).

Social judgment theorists have taken a different approach to application. They have stressed the need to consider the nature of the environment outside the laboratory (i.e., the environment of applications) *before* engaging in basic research. Consequently, social judgment theorists have developed a theory about judgment tasks outside the laboratory -- as well as a theory of judgment processes and a theory about the interactions of the two -- that

guides the development of judgment tasks for use in basic research within the laboratory.

A THEORY OF JUDGMENT TASKS

Throughout any ordinary day, policymakers are required to make judgments about the characteristics of objects, events, and individuals which cannot be directly observed. What are the circumstances that require people to make such judgments, and what makes some judgments more difficult and uncertain than others?

In reply to these questions, social judgment theorists point to the *zone of ambiguity* in the judgment task, that is, the conceptual space between that which can be observed and that which must be inferred because it cannot be observed. This concept represents an extension of Brunswik's lens model (*Figure 1*) of psychological functioning (Brunswik, 1952, 1956; see also Hammond, 1966). The lens model assumes that individuals rarely have direct access to the depth variable (i.e., the distal state) that they must judge. Instead, the environment gives rise to a number of surface variables (i.e., the proximal cues) of imperfect reliability and validity upon which they must base their inferences. The zone of ambiguity thus lies between the observable proximal cues and the unobservable distal state. It is the properties of this conceptual space that evoke different judgment processes and that make judgment tasks more or less difficult.

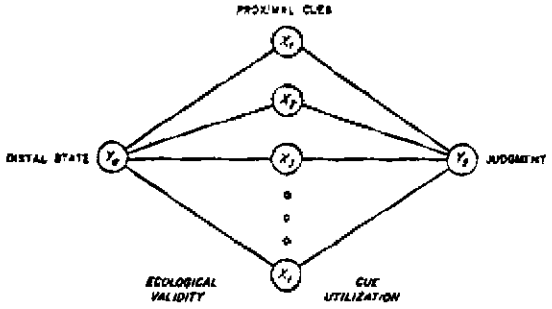

Fig. 1. Brunswik's lens model.

The zone of ambiguity can be described in terms of at least five parameters: (*a*) the ecological validity (i.e., weight or importance) of each cue; (*b*) the form of the function (e.g., linear or curvilinear) between each cue and the depth variable; (*c*) the organizing principle (e.g., additive or configural) of the task; (*d*) the probabilism (i.e., predictability or uncertainty) inherent in the task; and (*e*) the extent to which the cues are intercorrelated (i.e., the interdependence). It is variation in these properties of the zone of ambiguity in judgment tasks that makes generalization of results from the laboratory to applied settings so precarious. Without a theory that fully describes the parameters of judgment tasks in the real world, the judgment tasks used in laboratory research are likely to be designed to fit statistical and experimental convenience and, thus, to lack variation in these properties. Empirical results are therefore likely to be confined to specific circumstances, and applications are likely to fail--as they so often have. Social judgment theorists attempt (although they do not always succeed) to design their research so that it incorporates variations in the properties of the zone of ambiguity, thus making generalization from the laboratory to the real world possible. In short, an explicit theory of judgment tasks is logically prior to the development of a theory of judgment processes.

A THEORY OF JUDGMENT PROCESSES

According to the Principle of Parallel Concepts in SJT, the zone of ambiguity between the depth variable and surface cues in the judgment task is paralleled by a similar zone of ambiguity between cues and the judge's inference in the cognitive system (see Figure 1). Moreover, these zones can be described in similar terms. Thus, (*a*) the ecological validity of a cue is paralleled by the extent to which a given cue is utilized, (*b*) the form of the function between the cue and the depth variable is paralleled by the form of the function between the cue and the judgment, (*c*) the organizing principle in the judgment task is paralleled by the organizing principle in the cognitive system, (*d*) the predictability or uncertainty in the task is paralleled by the consistency or control in the cognitive system, and (*e*) the ecological cue interdependencies are paralleled by the interdependent utilization of the cues.

A THEORY OF COGNITIVE CHANGE

Adaptive cognitive change is facilitated by providing individuals with explicit information about the properties of the zones of ambiguity in either the task system or their own cognitive system, since it is variation in these properties that makes judgment [illegible] difficult. Adaptive cognitive change is facilitated by the pro-

vision of (*a*) information about the relations between the depth variable of the environment and its surface cues (the zone of ambiguity in the judgment task) or (*b*) information about the relations between surface cues and the policymaker's judgment (the zone of ambiguity in the cognitive system). Inasmuch as this information gives guidance with regard to the manner in which cognitive systems might advantageously be changed, it is therefore described as *cognitive feedback*.

Cognitive feedback can be contrasted with *outcome feedback* in which the individual has access to information about outcomes but not about relationships. Outcome feedback tells individuals whether their judgments lead to success or failure (or some variation thereof) but nothing about the reasons for this occurrence. In comparison to cognitive feedback, outcome feedback is inefficient in facilitating the improvement of judgments, a point demonstrated in the laboratory since 1965 (Deane, Hammond, & Summers, 1972; Hammond, 1971; Todd & Hammond, 1965). Indeed, outcome feedback may have *negative* effects on learning to improve judgment (Hammond, Summers, & Deane, 1973).

In short, outcome feedback is essentially *noncognitive* and its relevance is limited mainly to noncognitive situations, for example, in learning to improve psychomotor activity. It should be noted, however, that few psychologists other than social judgment theorists (most notably Bandura, 1971, pp. 5-6, 9) have recognized the relative unimportance of outcome feedback outside the laboratory. Unfortunately, the use of the outcome feedback paradigm in the study of judgment is still widely prevalent, mainly as a result of a failure to develop theories of the environment prior to theories of the organism.

It should be emphasized that cognitive feedback, rather than outcome feedback, is precisely the type of feedback that individuals try to provide for one another in their efforts to help one another to improve their judgments. For example, imagine medical students attempting to learn the art of diagnosis solely by a procedure that informed them whether they were right or wrong in each case. Nevertheless, the common verbal forms of cognitive feedback are extremely inefficient. Empirical research indicates that individuals frequently do not possess an accurate understanding of the zone of ambiguity in their own judgment systems (Cook & Stewart, 1975; Slovic, 1969; Slovic & Lichtenstein, 1971) and, furthermore, that verbal communication is an inefficient transmitter of such information (Blake & Mouton, 1961; Summers, Taliaferro, & Fletcher, 1970). Social judgment theorists, therefore, attempt to facilitate adaptive cognitive change by improving the quality of cognitive feedback and by developing new forms of cognitive feedback.

By analyzing quantitatively a series of judgments (see Hammond, Stewart, Brehmer, & Steinmann, 1975, for details), social judgment theorists construct a model of an individual's cognitive system (a judgment *policy*). The individual's policy can then be compared with other individuals' policies in terms of the similarities and

differences between their respective parameters (e.g., weights and function forms in the zone of ambiguity). Furthermore, if the properties of the judgment task are known, the fit between the parameters of the individual's judgment policy and the parameters of the task can also be determined, a comparison considerably facilitated by the fact that SJT describes cognitive systems and task systems in parallel terms. Moreover, social judgment theorists have developed the technical means to display such cognitive feedback in a pictorial form for easy interpretation and comparison (see Hammond, Stewart, Brehmer, & Steinmann, 1975, for details).

A TECHNOLOGY FOR COGNITIVE FEEDBACK

A computer program package designed especially for time-sharing use at interactive terminals (POLICY, Stewart & Carter, 1973) now makes it possible to provide cognitive feedback in pictorial form quickly and conveniently. Inasmuch as the computer program is available through the General Electric international time-sharing service, the procedures involved in the applications described below can be performed anywhere a telephone is available.

In brief, after engaging POLICY, the procedure allows an individual to enter a series of judgments at the terminal. The judgments are then analyzed by the program, and pictorial information regarding the individual's judgment policy is displayed at the terminal. Judgments of large numbers of individuals can also be entered and processed, and comparisons between individual policies or between individual policies and task systems can be displayed. POLICY was used to provide the cognitive feedback in each of the applications described later.

SUMMARY

Social Judgment Theory, its methods for providing cognitive feedback, and its technology for facilitating adaptive cognitive change have been briefly described. Application of these procedures, although developed in the laboratory through the process of basic research, have been intended from their beginning (because of emphasis upon the parameters of the zones of ambiguity) to be applied to critical problems in the formation of social policy. In the following sections, various applications of the methods of SJT will be considered. It is only by means of such applications that the generality of SJT beyond the laboratory can be tested and verified.

THE APPLICATION OF SOCIAL JUDGMENT THEORY

Three judgment problems exist in the formation of social policies: (*a*) exercising judgment about social values; (*b*) exercising judgment about scientific or technical data; and (*c*) integrating both sets of judgments in the final policy decision. For example, the decision to construct a nuclear energy facility is not only based on (*a*) social value judgments regarding the *relative importance* of such issues as the need for energy production, the quality of hazard safeguards, and the amount of environmental impact, but also on (*b*) scientific and technological judgments about the data or facts concerning those same issues. Differences in judgment must be resolved within areas of both social value and scientific fact, and the judgments in both areas must also be integrated in order to reach a final policy decision regarding the construction of the nuclear energy facility. This process of judgment is schematically indicated in Figure 2.

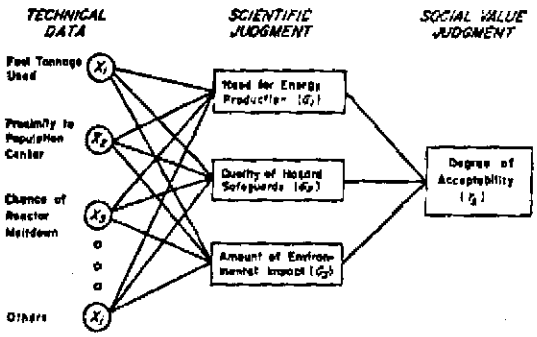

Fig. 2. An example of judgment about technical data and judgment about social value in the construction of nuclear energy facilities.

The following examples of the application of SJT to social policy problems are divided into two broad categories. The first set of examples illustrates the use of cognitive feedback for the purpose of externalizing judgment policies concerning the social values implicit in the formation of social policy. As is often the case in policy problems, these studies are focused primarily on issues of social value, rather than on the problem of scientific and technological judgments or the integration of the two. In these cases, cognitive feedback is used to (*a*) provide information about differences and similarities in individuals' judgment policies concerning the relative importance of competing social values, and (*b*) provide a controlled process by which such policies can be modified so that judgment can be improved or conflict can be reduced. (Technical data and scientific judgment are not included in these studies because the relevant facts were either already known, undisputed, or not yet at issue.)

In other situations, however, which are illustrated by the second set of examples, judgments of both social value and scientific fact are included and must be integrated in order to arrive at a final policy decision. Indeed, scientific and technological judgment become increasingly important as the relevant facts become either more uncertain or more greatly disputed. In these cases, cognitive feedback is used to provide a method for resolving differences in the judgment of scientific fact, as well as in the judgment of social value. In the following section, the approach of SJT to the externalization of judgment policies concerning social value is considered.

SOCIAL VALUE JUDGMENTS

The formation of social policy is always guided, implicitly or explicitly, by value judgments. Nevertheless, the reasons for these judgments are usually unclear. This is because policymakers must rely on verbal communication to explain the cognitive basis for their social value judgments which, in fact, they may not fully understand themselves. SJT, however, provides a means for making clear the judgment policies concerning the relative importance of competing social values. Through cognitive feedback, the parameters of the zone of ambiguity in a policymaker's cognitive system can be described in precise, pictorial form. As the three studies described later indicate, cognitive feedback can identify specific areas of interpersonal agreement and disagreement in social value judgments, and such information can be used effectively to reduce conflict among factions of policymakers and to develop acceptable compromise policies.

STUDY 1: PUBLIC PARTICIPATION IN REGIONAL PLANNING

Traditional forms of citizen participation in regional planning (e.g., public hearing, letters, opinion polls) seldom contain information about the relative importance of regional goals for growth and development. Issues are usually treated singly and in isolation rather than in the context of all the issues. Although all positive goals tend to be supported in the abstract, not all positive goals actually can be achieved, and achieving one may even preclude achieving another. Trade-offs between goals, based on their relative importance, must be made. Information about trade-offs remains unknown, however, if goals are considered in isolation.

In contrast, because the methods of SJT require citizens to make judgments about various *combinations* of goals, these methods do provide measures of their relative importance. Thus, citizens make judgments that involve trade-offs, just as planners must. For example, a policy that attracts new industry into an area may increase the availability of jobs and increase tax revenues, but new industry might also increase pollution and population density. By requiring citizens to make judgments about alternatives that include a variety of consequences, the present study required citizens to weigh the relative importance of conflicting goals of economic prosperity and environmental quality. Cognitive feedback then made it possible for citizens to see the weights, function forms, and consistency of their individual judgment policies and for planners to see the policies of the different factions in the community.

Description of the Study

The present study was conducted for the Office of the Governor of Colorado (Rohrbaugh, 1976). Because the study was intended to be more illustrative than fact-finding, little concern was given to establishing a random sample of participants. Approximately 100 residents of a county in southwestern Colorado participated in the study, which was conducted at two local groceries and the County Court House. Among these participants were 10 elected government officials (including the mayor, city council members, and county commissioners).

Summary of Results

After two days of data collection, a cluster analysis of citizens' judgments was conducted in order to identify groups (or factions) of citizens with similar judgment policies. Four large factions (and several minor ones) were found. The four major factions (see Figure 3) included 70% of the people in the sample, as well as all 10 public officials. Further analysis showed that the four policies were not extremely different. Indeed, a hypothetical compromise policy (also shown in Figure 3

was found that accounted for 50% of the variance in the judgments of all citizens clustered into the four factions. According to the compromise policy, strongest citizen concern was to avoid negative environmental impacts (relative weight of 35). Citizens placed moderate importance (relative weight of 20) on increasing recreational development (as much as possible) and increasing industrial development (to a point). Agricultural development and natural resource usage were least important (relative weights of 15 and 10, respectively).

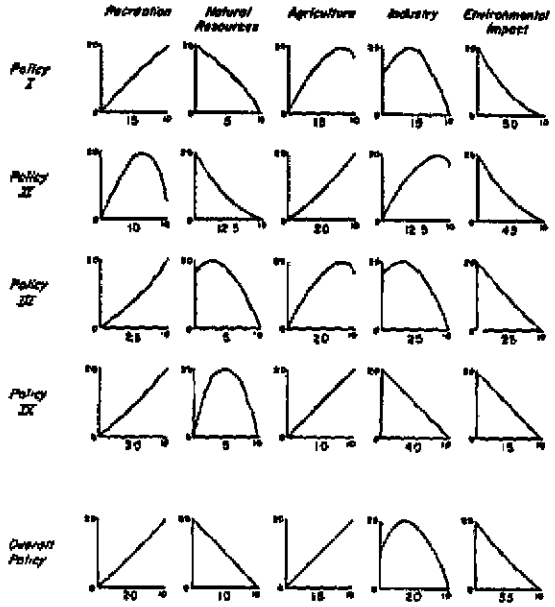

Fig. 3. Relative weights and function forms for four citizen factions and the resulting compromise policy.

What was the value of cognitive feedback in this study for the citizens who participated in it? First, it enabled them to gain information regarding their (*a*) distribution of weights (or trade-offs), (*b*) function forms relating cues to judgments, and (*c*) consistency in exercising their judgments. Second, they gained an appreciation of the complexity of the social value judgments that had to be made in a planning situation. Third, they became more sophisticated in their understanding of the social policy problem. Thus, their value judgments were more sophisticated than those made in a conversational context or in an opinion poll in which judgments are apt to be made regarding each issue separately and without consideration of their interdependencies. In short, cognitive feedback enabled the citizens to learn about their social value system as it functions under representative conditions, an opportunity not otherwise available to them.

What was the value of cognitive feedback for state officials? First, they discovered that there were factions with different points of view in the community, and, second, they discovered the cognitive bases of those factions. That is, they gained an understanding of the characteristics of the judgment policies that produced the specific judgments in the various factions, an understanding of the structure of the "policy ecology." Without cognitive feedback regarding weights and function forms, policymakers can only guess which aspects of citizens' judgment policies create agreement and disagreement. Because of their imperfect understanding of the cognitive aspects of the judgment process, policymakers ordinarily will attribute such differences to motives for personal gain, an attribution that seldom enhances the quality of the discussion of issues. The availability of cognitive feedback, however, enables policymakers to address themselves to the question of what "ought to be done" (i.e., the development of a social policy that fits the community's values), rather than the question of "who gets what" (i.e., differential rewards).

STUDY 2: FACULTY PARTICIPATION IN PLANNING THE FUTURE OF A UNIVERSITY

Planning within large institutions shares many of the problems of planning within government (indicated in the preceding example). Objectives are numerous and often entangled with one another in ways that are difficult to ascertain. In short, too much complexity exists for organizational managers to exercise their judgments effectively without some form of cognitive aid. Typically, organizational planners rely on oversimplifications similar to those described in relation to government planning. For example, common procedures are to (*a*) consider thoroughly only three or four of the numerous objectives, (*b*) consider each objective separately despite its (uncertain) interdependence with the others, and/or (*c*) switch the focus of consideration from objectives to three or four "scenarios."

In contrast, methods from SJT permit detailed analysis of values attached to a large variety of organizational objectives in context and to objectives at multiple levels in the policymaking process. Because judgments can be made both about the relative values of achieving specific objectives within levels and combinations of objectives between levels, an all-inclusive planning policy can be developed.

Description of the Study

The planning office of a state university sought the judgments of 36 faculty members and academic deans regarding the relative importance of six major academic planning areas: resource allocations, service allocations, research emphasis, academic emphasis, instruction methods, and faculty characteristics (Hammond & Smith, 1975; Smith, 1976). These six major areas were unfolded into 25 institutional objectives in order to establish academic goals for the next two decades (see Figure 4). Thus, a hierarchical or multilevel value judgment problem was constructed.

An interactive computer terminal was used to display a variety of profiles indicating specific levels of objectives within each of the six planning areas. After participants made value judgments on the desirability of each profile within each planning area, they then made judgments regarding the overall desirability of profiles that indicated a specific level of desirability for each of the six major planning areas. Participants received immediate cognitive feedback about their judgment policies, thus making it possible to compare the relative importance each person attached to each objective within a specific planning area, as well as the importance attached to each planning area itself. In addition, participants could judge that a given objective should remain at its present level, be decreased, or be increased, irrespective of its relative importance. Thus, comparisons could be made between the points of optimal desirability of each participant's function forms.

Summary of Results

Paralleling the public participation study, a cluster analysis of the judgments was carried out in order to detect factions of participants who had similar policies about trade-offs either within particular areas of planning or across the planning area as a whole. In contrast to the public participation study in which definite factions were found, considerable heterogeneity was found within the participating group of faculty members and academic deans. No factions were located that persistently held similar judgment policies across areas; even the anticipated faculty-administration factions did not appear.

What was the value of cognitive feedback in this study? First, as in the initial study, it allowed participants to discover the nature of their social judgment policies concerning the future of

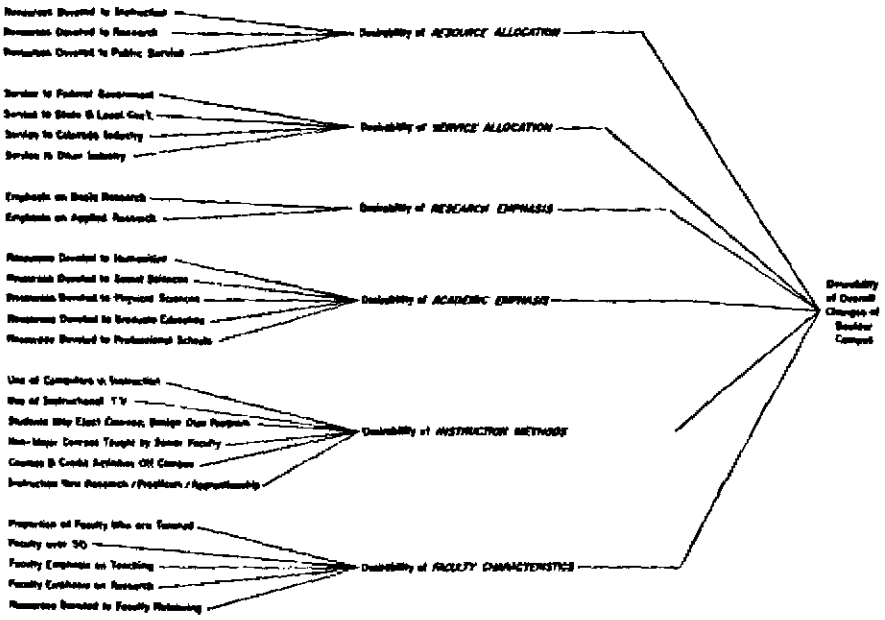

Fig. 4. A hierarchical judgment system for university planning.

the university. In addition, however, these participants had an opportunity to clarify and precisely describe their policies. Thus, there was a greater opportunity to develop a judgment policy in the context of the complex interdependencies in the policy task. Second, cognitive feedback enabled the participants to see *reasons* for the heterogeneity of value judgments among faculty members and administrative officials. Third, it allowed participants to discover that this heterogeneity was not the result of separate faculty *and* administration factions (as anticipated before the study); that is, they learned that stable factions did *not* exist. Since different participants were found to be in different factions across planning areas, considerable dispute of a diffuse nature could be expected, rather than the anticipated polarized dispute which would ordinarily be anticipated in general discussion regarding the proper objectives for the university. In short, the policy ecology at the university was different from that expected. The resolution of conflict among values was thus unlikely to be achieved through customary means (e.g., negotiations between faculty and administration).

STUDY 3: REDUCING CONFLICT IN LABOR-MANAGEMENT NEGOTIATION

The previous two studies indicated that cognitive feedback can provide useful information about individual judgments concerning social values or goals. This information is useful because it allows individuals both to understand their judgment policies more clearly and to communicate their judgment policies more precisely, as well as to reduce differences between persons with regard to their judgments about social values and goals (e.g., see Brehmer & Hammond, 1976; Hammond, 1965; Hammond, Stewart, Brehmer, & Steinmann, 1975). The principal result of roughly 30 studies in a dozen countries clearly indicates that the process of making social value judgments is itself conflict-producing. In contrast to popular belief (and the belief of many psychologists), self-serving motives are not the only possible explanation of interpersonal conflict. As the following study demonstrates, even labor-management disputes--which conventionally are thought to be totally determined by motives of personal gain--can be resolved by providing negotiators with cognitive feedback concerning their judgments of *social* values.

Description of the Study

Six negotiators (three from labor and three from management) who recently had been involved in a long *and* bitter strike at a major chemical company agreed to reenact their negotiations. Both sides agreed that the reenactment should begin with the situation as it stood one week prior to the settlement. Both sides also agreed that four issues remained at that point: contract duration, wage increases, number and use of certain "special workers," and

number of strikers to be recalled. Judgment analysis was employed to determine whether the cognitive aspects of the situation had contributed to the dispute and whether cognitive feedback might have shortened the strike (Balke, Hammond, & Meyer, 1973).

Profiles depicting 25 contracts that included differing magnitudes on four dimensions representing the four issues were presented to each negotiator, who (*a*) rated each of the contracts in terms of its acceptability to him, (*b*) indicated the weight that he thought he had placed on each of the four dimensions, and (*c*) predicted the weight that his counterpart placed on each dimension. Subsequently, four of the six negotiators received cognitive feedback that displayed their weights and function forms on the four dimensions, as well as the weights and function forms of their counterparts (two of the six negotiators served as a "control" pair and did not receive feedback).

Summary of Results

Self-understanding on the part of the negotiators was poor before cognitive feedback; estimation of the weights they placed on the four issues were inaccurate. The implication of such misunderstanding for negotiation is important. Inaccurate understanding of one's own negotiating policy is conflict-producing; it leads to the unwitting communication of misleading information.

Understanding of others was poor before cognitive feedback; neither side was able to predict the judgments of the other with any significant degree of accuracy, despite the fact that all negotiators expressed prior confidence that they understood their counterpart's judgment policies very well.

Intraunion and intramanagement uniformity varied before cognitive feedback; the three union negotiators were highly uniform in their policies, but the management negotiators were not. The union negotiators, therefore, did not face a uniform management negotiating policy. This situation was not apparent to either side.

Change in policy on the part of the two management negotiators was affected by the use of cognitive feedback (provided by an interactive computer terminal). Cognitive feedback clarified and rectified the above circumstances and led to change in policy that in turn led to increased agreement. After a second rating of the 25 contracts, union and management negotiators found a *number* of contracts acceptable. In short, the evidence suggests that judgment analysis and cognitive feedback could have shortened this dispute to a fraction of the time required by customary negotiation procedures in which the cognitive sources of conflict are ignored.

INTERNATIONAL APPLICATIONS OF SOCIAL JUDGMENT THEORY

In the above examples of the use of cognitive feedback to provide information about social value judgments and to reduce conflict arising from different value judgments, the people involved were at the same physical location and used a single computer terminal. This is an unnecessary restriction. The General Electric international time-sharing system now makes it possible for a display of a person's weights and function forms on one interactive terminal to be viewed simultaneously by a person at another terminal in many (roughly 25) of the countries of the Western world. The implications of such international communication are considerable: Judgment policies, not merely words, can now be transported worldwide immediately in pictorial and quantitative form.

This possibility was successfully demonstrated in a joint effort involving Alexander Wearing at the University of Melbourne and one of the present authors at the University of Colorado (Rohrbaugh, Cook, & Wearing, 1977). If it is indeed true that (*a*) cognitive processes in themselves can contribute to the persistence of conflict (as the evidence suggests), and (*b*) externalization of the parameters of cognitive systems can lead to conflict reduction (as the evidence also suggests), then judgment research together with modern international electronics may have produced a new, and perhaps effective, method of international negotiation.

THE SEPARATION AND INTEGRATION OF VALUES AND FACTS

The preceding studies illustrated the manner in which methods of Social Judgment Theory have been used to provide cognitive feedback about differences and similarities in value judgments among individuals, and thereby indicated a means for improving judgment and reducing interpersonal conflict produced by different judgments. One common aspect of the preceding studies was that none involved an assessment of facts. Social value judgments were being made prior to, or in the absence of, scientific or technical facts. Thus, differences in judgment occurred because of differences in values, not because of differences in the knowledge or acceptance of facts. Questions of "what ought to be" were at issue, rather than questions of "what is." Often, however, the exercise of judgment occurs in situations in which facts may not be well-known or accepted, and questions of value become entangled with questions of fact. In such instances, cognitive feedback becomes particularly important because it provides the means for disentangling values and facts so that each may receive separate attention before they are integrated.

The general framework for the problem of integrating facts and values is illustrated by the multilevel representation in Figure 5.

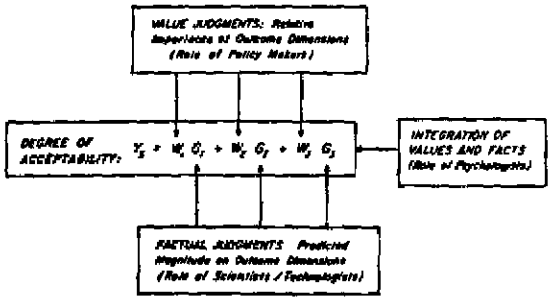

Fig. 5. The mathematical model for the separation and integration of scientific facts and social values.

For every social policy alternative, a policymaker's judgment of overall acceptability (Y_s) depends upon the relative importance (W_i) attached to the outcome dimensions or goals that define the policy problem. Often the specific magnitude of each dimension can be estimated only by judgment about scientific facts (G_i) pertinent to the particular policy alternative.

In these circumstances, cognitive feedback can be used to externalize areas of agreement and disagreement both among scientific and technological experts required to exercise their judgments about the social values inherent in policy alternatives Once differences in judgment are resolved among the experts with regard to facts, and among the policymakers with regard to the relative importance of values, the two sets of judgments can be integrated analytically rather than judgmentally.

The analytical process for integrating values and facts is based on the multiple regression model of judgment (Hammond, 1955; Hoffman, 1960; Hursch, Hammond, & Hursch, 1964; Sarbin, 1943; Thorndike, 1918; Wallace, 1923), which can be extended to include quadratic and nonmatric relations. As shown in Figure 5, the integration of social values and scientific facts is achieved by the equation

$$\hat{Y}_s = \Sigma W_i G_i$$

where,

Y_s is the degree of acceptability of the policy alternative,

W_i is the value or weight attached to each outcome dimension or goal (supplied by the judgment of the policymakers), and

G_i is the predicted magnitude on each outcome dimension

(supplied by the judgment of the scientists and technologists). The three following studies illustrate the applications of SJT in the separation and integration of values and facts in the context of social policy formation.

STUDY 4: PUBLIC ACQUISITION OF MUNICIPAL LAND FOR "OPEN SPACE"

One of the major reasons for inefficient policy formation in groups is the wrong focus of discussion; that is, debate takes place over specific policy outcomes (who gets what) prior to the development of the policy itself. As a result, long, trying debates engendered by a prior focus on particular outcomes and their relation, real or implied, to self-interest have come to be a part of public hearings.

The present study illustrates a means by which the general policy, rather than specific outcomes, can become the focus of policymakers. Rawls (1971) describes the social philosophy that underlies the argument for addressing the policy process prior to addressing outcomes. He asserts that "The aim is to set up a fair procedure so that any principles agreed to will be just.... Now in order to do this I assume that the parties are situated behind a veil of ignorance. They do not know how the various alternatives will affect their own particular case and they are obliged to evaluate principles solely on the basis of general considerations [p. 136]." The present study (Steinmann, Smith, Jurdem, & Hammond, 1977) demonstrates the manner in which cognitive feedback allows policy formation to be properly focused on principles, that is, on the relative importance of values rather than on outcomes.

The Assessment of Values

The Open Space Board of Trustees of Boulder, Colorado (consisting of an Open Space Coordinator and five citizens who served as Trustees) was instructed by the City Council to formulate a policy that would enable the board to decide which parcels of "open space" land it would acquire and the order in which it would acquire them. Variables (cues) involved in exercising judgment about the acquisition of land parcels were identified by the board. These included aesthetics, cost, favorability of location, need for action, use potential, contribution to protection of environment, and availability. Each board member made judgments about the desirability of acquiring 40 hypothetical parcels of land described in terms of profiles of the 7 variables. After exercising their judgments, the participants were provided with cognitive feedback: They were shown their weights and function forms for each of the variables, as well as the consistency of their individual judgment policies, by means of an interactive computer terminal.

Cognitive feedback was used to provide information about the individual judgment policies, and a means for reducing conflict among board members and achieving a compromise policy for land acquisition. Since correlations among the members' judgments showed moderate interindividual agreement (average r was .68), the mean of the board members' weights on each variable was used to form a tentative compromise policy. Board members were then shown the judgments that the compromise policy would provide for the 40 hypothetical parcels of land. After being shown these results, the board members decided to decrease the relative importance of cost and use potential and to increase the relative importance of location and need for action. Once agreement had been achieved with regard to the social value system (that is, the relative weights) to be employed, the board moved next to an assessment of facts.

The Assessment of Facts

The facts that had to be ascertained were specific ratings (e.g., aesthetics and cost) for each parcel of land that could be acquired. These had not been previously available, however, since variables such as aesthetics, favorability of location, use potential, and the like are not ordinarily measured and recorded in city files. In order to produce such an evaluation, the board members independently rated each parcel of land on the seven relevant variables. Although reliability among raters was only moderate (average r was .48), the means of these ratings across board members were used. (Note: Asking the board members, rather than technical experts experienced in such evaluations, to rate the land parcels was a mistake only partially recognized at the time. The next study deals with this matter in detail.)

The Integration of Values and Facts

The weights (W_i) of the compromise policy were combined with the mean ratings (G_i) of the board members on the seven outcome dimensions by means of the equation shown in Figure 5. This procedure yielded a set of judgments about the overall desirability of land parcels, which were rank-ordered to produce a list of acquisition priorities. The list, with minor changes, was accepted by the board.

What was learned? It was found that (*a*) judgment analysis and cognitive feedback can indeed be of assistance in the process of group policy formation, (*b*) the tiresome and expensive wrangling that is observed in most public discussions can be avoided by directing debate away from outcomes, (*c*) interpersonal learning can facilitate the reduction of counterproductive dispute, and, perhaps most important, (*d*) the problem of separating facts and values is critical and must be addressed directly. It is the last point that is considered in detail in the next example.

STUDY 5: THE SELECTION OF HANDGUN AMMUNITION FOR A POLICE DEPARTMENT

The separation of facts and values is a particularly important problem in those circumstances in which scientific facts are entangled with social values. In such instances, the facts may be available, but they may be widely disputed. The present study illustrates the successful application of judgment analysis and cognitive feedback to the problem of implementing a public policy based on the social values of the community, and the scientific facts.

The public policy question involved in the present study concerned the type of ammunition to be used by the Denver Police Department (DPD). This is a problem faced by other cities as well. When the DPD decided that the standard police ammunition provided insufficient stopping effectiveness (the ability to incapacitate a suspect) and recommended that it be replaced with "hollow point" ammunition, a major social dispute erupted. Opponents of hollow point ammunition argued that such bullets created excessive amounts of injury and that they increased the risk to innocent bystanders. Supporters of the change in ammunition argued that hollow points provided only minimal, if any, increase in the amount of injury and decreased the threat to innocent bystanders because of ricochet or bullets' passing through the initial target. Because of the valuative nature of such judgments, people took sides in the controversy and the community rapidly became polarized. Participation in the problem began when the polarization of the community had reached its height (Hammond, Stewart, Adelman, & Wascoe, 1975).

The Assessment of Values

Members of the Denver City Council, the Mayor, representatives of interested citizen groups, and members of the general public judged the acceptability of handgun bullets based on three functional characteristics of bullets (cues): their level of stopping effectiveness, injury, and threat to bystanders. Thus, measures of the *relative importance* placed on each of these characteristics were obtained from policymakers and other interested people. A cluster analysis identified groups of participants (factions) with similar social policies. City Council achieved compromise among these various factions by adopting a policy that assigned equal importance to the three cues--stopping effectiveness, injury, and threat to bystanders.

The Assessment of Facts

Because the facts concerning the characteristics of handgun ammunition were in dispute, five ballistics experts external to the dispute were convened and asked to exercise their judgment with regard to the potential effects of 80 different bullets.

They considered such ballistic characteristics (cues) as the weight of the bullet, its muzzle velocity, the amount of kinetic energy it lost in a target simulating human tissues, and other factual data. From this information, they made independent judgments about each bullet's potential stopping effectiveness, injury, and threat to bystanders. Once the assessment of facts had been completely separated from the assessment of social values, it was discovered that little controversy existed among the technical experts concerning the potential effects of the actual bullets.

The Integration of Values and Facts

The weights (W_i) of the compromise social policy were combined with the mean ratings of the technical experts (G_i) on the three dimensions used by the technical experts to judge the specific bullets. The general procedure for combining social policy and scientific judgments is again represented by the multiple regression equation shown in Figure 5. As a result of the application of this procedure to the data from 80 different bullets, the bullet with the greatest predicted social acceptability was identified as a specific hollow point bullet that had more stopping effectiveness but caused no greater injury and was less of a threat to bystanders than the standard bullet then in use. That bullet was accepted by members of the City Council (including those who had originally opposed the use of any hollow point bullet) and is now the official ammunition of the Denver Police Department.

The process used for selecting handgun ammunition constituted an advancement in analytical procedure (as compared to the Open Space Study) because it allowed the complete separation of judgment about social policy and judgment about scientific facts (rather than having both sets of judgments made by the same group of participants). The solution to a critical social problem was achieved because the focus of the community was shifted from concern about specific outcomes (i.e., this bullet or that bullet) to an explicit consideration, enhanced by the use of judgment analysis and cognitive feedback, of social policy.

STUDY 6: LINKING COGNITIVE AND ENVIRONMENTAL MODELS IN FACULTY PLANNING

In the present example, a *symmetrical linkage system* is described that links a model of a cognitive system based on social value judgments to a model of an environmental system based on judgments about technical facts. The method illustrates the considerable advantages for the planner or policymaker when models providing cognitive feedback as well as models providing factual information about the environmental system are available.

The specific problem investigated was the need to establish a

set of hiring, promotion, and retirement policies at a state university that would avoid negative consequences, such as limiting the acquisition of new faculty members, and yet meet traditional academic conventions, such as tenure, under "no growth" conditions (Hammond, Mumpower, & Smith, 1977). Both faculty members and deans, therefore, had to exercise their judgments regarding faculty personnel policies for the present *and* the future.

Environmental Model of Facts

A computer model that describes faculty growth under various conditions was employed (Taylor & Scott, 1973). Seven *initial decision* variables (e.g., mandatory retirement age, percent denied tenure) described present personnel policies, and six *outcome* variables (percent of faculty who are tenured, full professors, newly hired) described the resultant composition of the faculty x years later. The initial decision variables and the outcome variables thus composed the input and output of the model.

Judgment Model of Values

Two judgment models of social values were constructed for each planner--a model of the judgment policy regarding the desirability of initial conditions, and a model regarding the desirability of outcome conditions. Each planner rated the desirability of 30 profiles of possible outcome conditions. The properties (weights, function forms, consistency, optimal points) of a planner's judgment policy about the desirability of initial conditions were then externalized and displayed for inspection by means of an interactive computer terminal. The planner could review and then change this policy, if so desired, with complete cognitive control. Similarly, the properties of the planner's policy about the desirability of outcomes were externalized, displayed and could be changed if desired.

Interaction of the Models

The primary goal of the procedure was to aid planners in identifying the most desirable configuration of possible initial *and* outcome conditions. The first step of this procedure was to display the factual consequences of the planner's social values with the use of the environmental model. That is, the planner was shown the outcomes that would result from the implementation of initial conditions judged to be desirable and, similarly, the initial conditions required to produce the outcomes judged as most desirable. As might be expected under actual planning circumstances, initial conditions judged to be optimal did not always produce an optimal set of outcomes, and vice versa. That is, the planner's social values were to some extent incongruent with the constraints of the factual environment.

The planner resolved this incongruence by specifying a trade-off between initial conditions and outcomes; that is, the planner indicated the relative importance attached to achieving desirable initial conditions versus desirable outcomes (e.g., equal weight assigned to both, outcomes assigned twice as much weight as initial conditions). After this trade-off was specified, the models of the planner's two judgment policies were simultaneously applied to all configurations of initial conditions and outcomes generated by the environmental model. Thus the planner identified the most desirable configuration of initial conditions and outcomes in terms of (*a*) the planner's policy about the desirability of initial conditions, (*b*) the planner's policy about the desirability of outcomes, and (*c*) the relative importance of achieving desirable outcomes versus desirable initial conditions. In short, the optimal configuration of initial conditions and resultant outcomes was identified in terms of the planner's judgment policy concerning social values.

There are substantial advantages to a symmetrical linkage system that brings together cognitive feedback from models of cognitive and environmental systems. If planners have access only to models of their own judgment policies about social values, they will not learn of their environmental consequences (e.g., that optimal initial conditions do not produce optimal outcomes) without suffering the actual consequences. Similarly, if only models of the environmental system are available, the planner can never be sure of finding the configuration of initial conditions and outcomes that best satisfies the set of social values. Only by bringing together the two models through cognitive feedback can the potential contribution of each type of model to policy formation be fully realized. For only in this way can the planner discover how best to fulfill the social values given the constraints of the factual environment.

SOCIAL POLICY CONSULTANT: A NEW ROLE FOR PSYCHOLOGISTS

Human judgment produces legislative acts, executive orders, judicial decisions, city ordinances, and corporate decisions as well as the citizens' reaction to the wisdom reflected in social policies. What should the psychologist's role be in relation to this critical cognitive activity?

There are four conventional answers to this question: (*a*) *provide perspective* (e.g., write books and articles of broad social significance); (*b*) act as an *expert witness* (e.g., describe the type of day care center that research has shown to be best); (*c*) *evaluate programs* (e.g., carry out evaluation research regarding educational efforts); and (*d*) *advocate policies* (e.g., advocate mental health programs). The alert reader will have noted, however,

that the role of the judgment researcher in the examples provided above fits none of these categories--in fact, an altogether different role was assumed. That new role involved *direct intervention* in the policy process, and such intervention came in the form of helping the policymaker to think. This role differs sharply from the traditional ones of providing the policymaker with information about which to think.

Is such a role a legitimate activity for psychologists? Our answer is yes, because, if psychologists fail to acknowledge this new responsibility, brought about by psychological research, as a result of uncritical examination of tradition or false modesty, they may well find that errors due to abstention were far more costly to society than errors due to participation (see Hammond & Adelman, 1976, for an extensive discussion of such interventions).

Whether psychologists accept this responsibility will depend not only on whether they believe that psychologists ought to help policymakers think, but also on whether they believe that psychologists can help policymakers to think. We believe both that policymakers ought to be assisted in their complex decision making, and that such assistance can be made. Although our understanding of human judgment is far from perfect, it does not need to be perfect--only good enough to be useful.

Whether the new role of psychologists can be viewed as useful depends upon one's appraisal of (*a*) the present ability of *unaided* human judgment to cope with the complex, entangled, uncertainty-ridden policy tasks now confronting policymakers, (*b*) the *increment of aid* already provided by decision theorists, operations researchers, and systems analysts, and (*c*) the ability of psychologists to provide an *increment of aid beyond* that presently offered. The decision, in short, is inescapably comparative, not absolute. The comparative judgment offered here is that judgment theorists can provide a significant increment in cognitive aid, beyond that currently available, which can (and will) be used effectively by policymakers. The examples provided in the present chapter, as well as those in the chapters that follow, offer readers an opportunity to exercise their own judgments in this regard.

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