# ON INTEGRATING BEHAVIORAL AND PHILOSOPHICAL SYSTEMS: TOWARD A UNIFIED THEORY OF PROBLEM-SOLVING

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. . . there is danger that the philosophy which tries to escape the form of generation by taking refuge under the form of eternity will only come under the form of a bygone generation. To try to escape from the snares and pitfalls of time by recourse to traditional problems and interests—rather than that let the dead bury their own dead. *Better it is for philosophy to err in active participation in the living struggles and issues of its own age and times than to maintain an immune agnostic impeccability, without relevancy and bearing in the generating ideas of its contemporary present* [11, p. 222; our emphasis].

John Dewey
*Philosophy and Civilization*

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## INTRODUCTION: BEYOND THE DISCIPLINES

One of the most distressing aspects of current academic life is the relative ease with which the separate disciplines are able to maintain themselves, if not to continue proliferating. As a natural accompaniment to this phenomenon is the obsession with the carving out and maintenance of clear boundary lines between them. Thus one often encounters such expressions as: "*This* is a philosophical problem; *that* is a psychological or a sociological one" (Popper, 1965, 1974). As we have argued elsewhere (Mitroff, 1974), such a conception takes as unproblematic (i.e., the distinctions between the disciplines) the very thing that on deeper reflection proves to be contentious and unclear (Ackoff and Emery, 1972; Churchman, 1968, 1971). More than the mere assertion of independence and autonomy between disciplines is required to establish them (ibid.). More ought to be required.

Where did such a conception of knowledge arise? How was it able to sustain itself? What are the "costs" and "benefits" (broadly conceived) of maintaining such an organization or a design for knowledge? Are other designs not based on such differences possible?

In this chapter, we wish to explore a different organization for knowledge. We are more concerned with what each of the disciplines has potentially to contribute to the others than with exaggerating and maintaining the differences between them. Our central focus is that of social or societal problem-solving. We propose to look at a selected subset of the disciplines and examine each of them with regard to what each uniquely has to contribute to a *systemic* theory of societal problem-solving. We propose to look at some of the disciplines as characteristic bodies of knowledge for societal problem-solving, not as specialized bodies of knowledge existing for their own sake. We are concerned not only with how each discipline impacts on the others, but with how each discipline actually presupposes the others in a nontrivial way (Churchman, 1971).

In more ways than one, our method basically derives from that of Dewey (McDermott, 1973), Churchman (1968, 1971) and Ackoff (1972, 1974). As such, we not only owe a basic debt to these thinkers, but in accord with them, our perspective follows squarely in the pragmatic tradition. Thus we conceive of effective problem-solving, in the social or societal sense, as the central organizing theme as well as the justification for the disciplines.

This is anything but to say that the disciplines are necessarily aware of this. Indeed, it is fair to say that the disciplines are more preoccupied than ever with *es*oteric rather than with *ex*oteric problem solving (Churchman, 1968). In contradistinction to the prevailing attitude, the disciplines only take on meaning for us by virtue of their exoteric impact on societal life.

We see each discipline as engaged in a particular kind of problem-solving endeavor. Accordingly, we evaluate each discipline with regard to which problems it is attempting to solve and by which characteristic methods (Ackoff, 1974; Churchman, 1968, 1971). From this standpoint, it makes no sense to talk of disinterested inquiry or of a disinterested inquirer (problem-solver) (Mitroff, 1974). By its very nature, inquiry is directed toward the goal of resolving a "problematic situation" (McDermott, 1973). Inquiry or problem-solving is at its basic core a purposeful and a value constituted activity.

Finally, we see our own efforts as directed toward the construction of an exoteric *theory* of societal problem-solving. We do not see where the terms "exoteric," "societal," "pragmatic," and "problem-solving" imply a renunciation of theoretical concerns or are any less theoretical than esoteric problem-solving. Quite the contrary. We see exoteric problem-solving as more theoretical, not less, than esoteric problem-solving. The reason is that exoteric problem-solving requires the theoretical (i.e., conceptual) unification of more disciplines not less than esoteric problem-solving. As a result, it represents an even more difficult theoretical task. We turn now to the subsample of disciplines and concerns we shall use to make our points.

## BEHAVIORAL VERSUS PHILOSOPHIC GROUP PROBLEM-SOLVING METHODS

The group of methods we have chosen to discuss come from two broad areas of scholarly interest: (a) behavioral science and (b) philosophy. We have very specifically chosen to concentrate our efforts on these two broad subject areas for the following reasons:

1. It seems to us that the separation and the resulting tension (hostility is an even better word) between these two ways of looking at social and physical phenomena is as strong as one could hope to find in current academe (Popper, 1965, 1974).
2. Therefore, a discussion of the problems involved in interrelating these two fields of inquiry to create a theory of effective societal problem-solving more than adequately serves as a model for relating any two fields of knowledge.

Even stronger, we would contend that these two areas of inquiry are in dire need of reconciliation. Behavioral science without philosophy is unreflective and in constant danger of oversimplifying and demeaning its basic subject matter—man. Philosophy without behavioral science, on the other hand, is in constant danger of presupposing falsehoods about the nature of man, not to mention appearing utterly naive. Both fields need each other much more than they realize, and appear capable of admitting at the present time.

For the past few years the authors have actively been engaged in researching the applicability of various behavioral and philosophical systems as group problem-solving methodologies. This research has involved two distinct but related aspects: the so-called theoretical development or transformation of each of these systems into a generalized methodology or theory for group problem-solving and (b) the further development or transformation of the theory into a concrete technology, that is, into a detailed series of actual working steps for problem-solving. Whereas the theoretical aspect or phase involves the conceptual elaboration of each of these systems, the technological aspect involves the refinement of these systems as actual working techniques. We have not only studied these systems theoretically, but have also applied and tested many of the theoretical relationships in actual case studies concerned with all-too-real problem situations (Mitroff, Barabba, and Kilmann, 1976).

The behavioral systems whose properties we have investigated can be distinguished by the following labels. After merely listing them, we briefly explain each: (a) the *ad hoc* group technology, (b) the MAPS design technology, (c) the Jungian group technology, (d) the interest-group technology, and (e) the synthetic group technology. The philosophical systems that we have developed as problem-solving technologies basically derive from Churchman's characterization of some of the major systems in Western epistemology: (a) the Lockean inquiry system (IS), (b) the Leibnizian IS, (c) the Kantian IS, (d) the Hegelian IS, and (e) the Singerian IS. As we indicated earlier, we have been primarily concerned with studying the relationships between these systems so that ultimately one could develop a metatheory of problem solving, that is, so that one could begin to specify which system seems "best" (in some sense) for which problems and environments, depending on the type of problem-solver (ibid.). In order to get to this part of our story, however, we need to explain each system very briefly.

## BEHAVIORAL SYSTEMS

*The Ad Hoc Group Technology*

The first system in our taxonomy is in a number of senses the most elementary and primitive and hence one of the most commonly used and prevalent in everyday life. The very label of the system, the *ad hoc* group technology directly suggests its method and meaning. The *ad hoc* system is applicable to those situations wherein a relatively large group of people are brought together on an *ad hoc* or somewhat random basis, and for which it is necessary to divide the original group into a number of small (i.e., five to eight persons) groups in order to foster effective interpersonal discussion for group problem-solving. The system is labeled *ad hoc* for two basic reasons: (a) the original set of persons are assembled on an *ad hoc* or random basis and (b) they are assigned to the small groups on a nonsystematic or random basis. As we see later, the basis of initial selection of group members and their subsequent assignment to small groups is sufficient to differentiate the various systems from one another.

As simple as this first system seems, we would caution the reader not to be deceived by its apparent simplicity. It can not only be an extremely powerful method of problem-solving in the hands of the right overall group leader, but also a very effective device for making some important points about group process.

The methodological basis of this system derives from the by now enormous literature on small groups, i.e., how group performance of all kinds is affected by the particular composition of the groups, the interpersonal climate that is created and reinforced in them, and the style of leadership that is manifested (Shaw, 1956). The methodological basis, in other words, derives from the extensive research conducted on small groups in primarily laboratory settings. Most important of all, each group method to be described is based on the premise that group problem-solving is, under complex circumstances, superior to isolated or individual problem-solving (Hoffman and Maier, 1964).

In the typical application of the *ad hoc* technology, people are either assigned on a random basis by the leader of a group, or they assign themselves on the basis of superficial impressions of one another to various small-person groups. The groups are then instructed by the central leader (in an organization, this could be an outside consultant, supervisor, etc.) to come up with a group statement reflecting a more refined definition of the problem or issue facing the group or organization as a whole and a set of proposed *alternative* solutions to the problem. After the small groups have worked independently for a period of time specified in advance by the leader or instructor, the small groups are instructed to stop their discussion and share their perceptions of the problem and potential solutions. While the definitions of the problem and the proposed solutions differ from small group to group, they typically do not differ as much from one another as they do from the other group technologies.

Since it has previously been explained to the persons that the groups are going through this process to gain some insight as to how group structure and composition can effect the quality of problem definition and solving, the groups are asked to reflect on why there is more of a similarity than a difference between their small group efforts. Typically, the groups come to see on their own that the reason is basically due to the fact that despite their convening on an *ad hoc* basis, their backgrounds may not be all that different if they are all working for the same organization. The same general set of problem skills and educational backgrounds are basically represented in the particular setting. Even more important, they come to see that the structure and composition of all of the small groups was basically the same. The social conditions were not set up to allow for what differences might be present to surface in a dramatic and hence more readily observable fashion.

If the foregoing represents or highlights some of the weaknesses of this approach, it should not be construed as an outright condemnation of it. The great strength of this approach is that it does provide alternate views of a complex problem situation at a relatively low cost. More time-consuming and costly behavioral and statistical techniques are not utilized to provide different views of the problem situation.

It should be mentioned at this point why different views of a problem situation are being sought and created if need be. The first author has recently operationalized a relatively new kind of statistical error, $E_{III}$, or the error of the third kind (Mitroff and Featherington, 1974). The variable $E_{III}$ is defined as "the probability of solving the 'wrong' problem when one should have solved the 'right' problem." As such, it represents a more fundamental error than the usual type I ($E_I$) and type II ($E_{II}$) errors of statistics. Essentially, $E_{III}$ refers to the choice *between competing paradigmatic views* of a problem situation, whereas $E_I$ and $E_{II}$ pertain to the *most efficient* solution to a problem *within* a particular paradigm. Essentially, $E_{III}$ asks, what good does it do to find the most efficient or precise answer to the wrong question or problem? To do this is to commit the fallacy, if not the madness, of misplaced precision in the worst way.

Without defining in depth what the terms "right" and "wrong" mean in such a context, the point that the concept of $E_{III}$ forces one to recognize is that any determination of "rightness" and "wrongness" can only take place if we have alternate views of a problem available to us so that we can compare how a problem changes in scope and character as we view it differently. Thus if one would make any assessment of $E_{III}$, there must first be some method or set of methods for generating alternate views of a problem. Furthermore, as some recent commentators have noted—most notably Paul Feyerabend—the proliferation of alternate views of any problem is not to be regarded as a mere luxury or nuisance to be tolerated but as a dire necessity in problem solving (Feyerabend, 1975). According to Feyerabend, the proliferation of the most radically contesting alternatives is to be strongly encouraged at every stage in the problem-solving process. It is absolutely indispensable to scientific progress. It is for this and many other reasons (Mitroff, 1974) that we have invested our energies with regard to finding methods for the proliferation of alternate views of any and every problem situation.

*The MAPS Design Technology*

The MAPS (acronym for "multivariate analysis participative structure") design technology, which was developed by the second author (Kilmann, 1977; Kilmann and McKelvey, 1975), represents the first of the structured group methods discussed in this chapter. Essentially, MAPS uses the input to two structured questionnaires to make three determinations:

1. Given a set of *n* items or tasks seen by a group as necessary to accomplish, what is the best sorting of the items into independent and homogeneous task clusters as formed by various multivariate analyses?
2. Given a set of *m* persons involved in the problem situation, what is the best sorting of the persons into independent and homogeneous people clusters, where the homogeneous clusters represent similarity of interests, abilities, interpersonal attraction, or effectiveness?
3. Given steps (1) and (2) above, what is the best assignment or match between task and people clusters?

In other words, MAPS attempts to determine which particular subset of people is best suited to collaboration with regard to which particular subset of tasks, thereby matching people to people, tasks to tasks, and finally, people to tasks.

The actual MAPS procedure or technology is much more complicated than can be described in a short chapter. Much more is involved than the running of computer programs for multivariate analysis. One can even argue that the actual statistical analyses are the smallest part of the whole technology. Participant responses to the questionnaires that ultimately form the input to the computer programs are preceded by a large number of behavioral steps designed to secure meaningful and active participant involvement to ensure validity of the resulting analyses. And in fact, any one of the other methods in our taxonomy is often used to accomplish precisely this. For example, we show in a moment how the Jungian group technology can be used to generate alternate problem statements or sets of tasks that are seen as inherent in a problem situation. Although distinct from one another, nothing has been said to imply that the methods do not all presuppose one another at one point in their application or another. Indeed, it is ultimately our goal to show how all these methods come together.

Once the separate small groups that MAPS creates are formed, the technology proceeds essentially as in the *ad hoc* technology. The main difference is that each group is now charged with working on only its set of homogeneous task items (creating a definition of the problem and proposing a set of potential solutions), and not with the problems contained in the other groups. If the original problem can thus be decomposed into the solution of the separate problems of the small groups created by MAPS, the procedure terminates. If the original problem can not be so decomposed, that is, if the relationships between the problems of the separate small groups can not be ignored, then the synthetic group technology, the last of our behavioral technologies, must be resorted to in order to put the parts back together again.

*The Jungian Group Technology*

Of all of the technologies outlined here, the one based on the personality system of Jung may be the most personally intriguing to the authors (Jung, 1923). If the *ad hoc* technology represents a method of group problem-solving that is based on bringing people together on a (partially) *random* basis, and if MAPS represents in essence a computerized version of a *structural–functional* approach to problem-solving, then the Jungian technology represents a group problem-solving method based on sorting people into small groups, based in turn on *pure psychological* differences between them.

For the purposes of this chapter, two dimensions, in particular of the Jungian personality system, are of special importance: (a) an individual's preference for the kind of input data that he characteristically seeks to obtain from the "outside world" and (b) an individual's preference for the kind of "decisionmaking process" the individual characteristically brings to bear on the preferred kind of input data.

According to Jung (1923), individuals can take in data from the outside world by either *sensation* or *intuition,* but not by both simultaneously. The reason is that sensation or intuition are antithetical processes. As a result, individuals tend to develop a preference for only one mode of input.

Sensation refers to those individuals who typically take in information via the senses, who are most comfortable when attending to the details and specifics of any situation, and who prefer hard, impersonal facts. Sensation types are realists. They take a hard, objective stand with regard to reality, are oriented to the "here and now," and are practical. They are concerned with what's feasible and "do-able" in the immediate present, not with vague plans for some unspecified future.

In contrast, intuition refers to those individuals who typically take in information by means of their imagination, by seeing the whole—the *gestalt*—of any situation. These individuals typically prefer the hypothetical possibilities in any situation to the "actual" facts. Intuition types are idealists. They are not oriented to the immediate present, to the here and now, but prefer instead to use their imagination to take a long-range view of any situation. Intuition types prefer to concentrate on and visualize "what might be" in contrast to "what is."

According to Jung, there are two basic ways of reaching a decision—*thinking* and *feeling* (Jung, 1923). As in the case of sensation and intuition, these two processes are mutually antithetical and thus individuals tend to develop a preference for only one of these modes of decisionmaking.

Thinking is the process of reaching a decision based on impersonal, analytical modes of reasoning. Thinking is the function that seeks to *explain things* in scientific and theoretical terms independent of human purposes, needs, and concerns. Another way to put this is to say that thinking is concerned with theories and the "truth" of things, not with their value and how people feel about them.

Thinking generalizes. Given two or more different people, objects, or events, it seeks to find and to explain what they have in common in abstract, theoretical terms, not in human terms. It is not concerned with particular events, people, or objects. The highest forms of thinking are found in logic and science where the individual object or individual only has meaning by virtue of the fact that it has a place within some well-developed theoretical system of scientific laws or principles.

Feeling, on the other hand, is the process of a reaching of a decision based on personalistic, value judgments that may be highly unique to the particular individual. It should be noted that by "feeling" Jung does not mean "emotion," for all of the types are, or can be, emotional. Rather, by feeling Jung means a particular style of reasoning, valuing, and reaching a decision. Feeling types are particularly sensitive to people and to individual differences. Feeling is the function that, rather than seeking to "explain" things in impersonal, scientific terms, seeks to empathize with them and value them in human terms. Thus, where thinking asks whether something is true or false, feeling asks whether it is good or bad, ethical or unethical, and likeable or unlikeable.

Feeling individuates. Given two or more people, objects, or events that are the "same," feeling seeks to find and emphasize with what is uniquely characteristic or different about each of them. The highest forms of feeling are found in ethical systems, literature, and art, which stress the uniqueness and individuality of all people—the fact that each person is to be treated as a unique "end" in himself or herself and not merely as one of an infinite number of similar "means" to be manipulated for society's ends (Kant, 1956). Feeling stresses the unique worth and value of every object—inanimate as well as animate—of the entire universe.

Thus, regardless of how one takes in data (by either intuition or sensation), one may come to some conclusion about the data by either a logical, impersonal analysis (thinking) or by a subjective, personal process (feeling). Since these two dimensions are independent of one another, we may combine them in all possible ways to finally get the following four personality types: (a) sensing–thinking (STs), (b) sensing–feeling (SFs), (c) intuition–feeling (NFs), and (d) intuition–thinking (NTs).

We have found as a general rule that different personality types not only prefer to work on fundamentally different problems, but also, that when given the opportunity to mold a common problem from the beginning, they formulate the very same problem in very different terms. For example, we have found that STs not only prefer to work on well-defined, technical problems, but even stronger, to cast all problems into the mold of a well-defined, technical problem. This style of problem forming and solving is governed by the search for a single optional or best solution *within* the tight constraints of a *single, well-defined,* and *precise* formulation of the problem or paradigm. Above all, this style values consistency, logic, precision, specificity, and an impersonal, dispassionate approach as *the* approach to *all* problems.

In a similar vein, SFs tend to prefer well-defined social problems. With the major exception of this type's concern for people, feelings, and values, this approach tends to be the same as that of the STs. There is the same emphasis on details and specificity and on working within a single well-understood and widely accepted formulation of the problem or research paradigm. The main difference is that where the ST musters consistency, precision, and a technical or logical approach to the problem, the SF explores a personal or moral approach. Whereas "thinking" types tend to see and hence to stress the technical features of problems, "feeling" types tend to see and hence stress the human, personal, moral, and the value features of problems.

The NTs and NFs prefer, respectively, to work on strategic (i.e., ill-defined), technical, and strategic–social approaches to problem solving. It is not on exploring a problem in depth from *within* the confines of a single viewpoint or paradigm but rather it is on examining how a problem looks and changes in character as we shift *between* paradigms and viewpoints.

To summarize briefly, operational or "sensing"-type problem-solvers are strongly oriented to perceiving and formulating all problems as well-structured (Mitroff, 1973, 1974). In the extreme, this means that something is a problem if and only if it possesses a precise and unambiguous solution *within* a single and tight formulation of the problem. Problems or issues perceived as ambiguous or subject to sharply conflicting opinions tend (again in the extreme) to be rejected as a problem that cannot be subjected to scientific analysis. Strategic or "intuition"-type problem-solvers, on the other hand, tend to perceive and formulate all problems as ill-structured. In the extreme, this means that something is a problem if and only if it changes drastically in character as we move *between* different formulations of the problem. In short, operational problem-solvers are "within-schema" *solvers,* whereas strategic problem-solvers are "between-scheme" *formulators* or problem *finders*. Operational problem-solvers stress the "solving" side of the inquiry process, whereas strategic problem-solvers stress the "finding" side.

The preceding observation constitutes the methodological background of the Jungian personality groups formed by this procedure (ST, NT, NF, tion of a relatively short test designed to measure a person's Jungian type (Myers, 1967). Next, each person is asked to write out their own individual interpretation of the problem situation facing their organization. The purpose of this step is to get the individuals thinking about the problem and prepare them for the next step.

Based on their Jungian type, the individuals are assembled into small groups containing all those individuals of the same personality type. Each of the Jungian personality group formed by this procedure (ST, NT, NF, and SF) is instructed to come up with a group version of the problem. The last step consists of a sharing of the four group statements plus an explanation by the instructor of the Jungian system. Since the Jungian group technology usually results in a strengthening of personality effects, the purpose of this last step is to illustrate to the participants the dramatic differences in views that typically results. Even more, the purpose is to illustrate the underlying psychological reasons for the differences. Furthermore, analyzing four views is considerably easier than discussing up to 40-odd different views. Finally, if a problem can be decomposed into its ST, NT, NF, and SF components and the component problems solved independently, the procedure terminates. If not, it is necessary to use what we have called the "synthetic technology" to synthesize the parts.

Perhaps enough has already been said to justify utilization of the Jungian personality types as a basis for a group problem-solving method. Be this as it may, it should be mentioned that we have utilized this system for two main reasons:

1. We have found that the dimensions of the Jungian system are more comprehensive than those of other personality systems. Thus other systems can be more easily mapped onto the Jungian system than vice versa.
2. The Jungian personality types are relatively neutral in their value connotation. This is the more important reason.

In applying and explaining the system, we always take special pains to point out that *each* type has major strengths as well as weaknesses: all of them are needed to complement one another. Thus it carries no special value connotation to be classified as an ST, NT, or other type. The same, however, cannot be said of other personality systems. It would be rather difficult, to put it mildly, to place all the anal-compulsives in one group, the hysterics in another, and then to debrief systematically the views of these groups, let alone to explain the basis on which they were placed in the different groups! Even if one could carry this procedure out, one would have even more reason to be dubious of it on moral and ethical grounds!

*The Interest Group Technology*

If the *ad hoc* technology represents a procedure for bringing people together on a random basis, then the interest-group technology represents the exact opposite of this approach. In the interest-group technology people are assembled into small groups on the basis of previous knowledge, or the fact that they represent certain interests. For example, they may all share the same educational background, philosophical perspective, or political interests. Based on what interests they represent, they are assembled into small groups and instructed as in the previous technologies to produce a definition of the problem or issue plus a set of proposed solutions. The varying definitions and solutions are then shared with all groups to demonstrate once again how the special perspective one brings to an issue affects its treatment. If the problem can be treated as the sum of the separate perspectives, then the problem is solved by solution of its components.

*The Synthetic Group Technology*

The last of our behavioral technologies is introduced as a separate method to emphasize that synthesis is a special act not present in all problem-solving efforts. Our whole point is that the very emphasis on disciplinary specialization of which we are so critical is by itself one of the major factors responsible for nonintegrated problem-solving efforts and methods—in short, for reductionistic approaches to problem-solving. There would be no need to single out for special mention a synthetic technology if it were already a natural part of the disciplines themselves.

In one sense, the synthetic group technology presupposes the previous methods. Before one can engage in synthesis, one must have something to synthesize. However, in another sense, synthesis need not presuppose previous reductionistic steps. As the growing interest in systems thinking indicates, synthetic approaches are emerging as important and valid methodologies in their own right (Ackoff, 1974; Ackoff and Emery, 1972; Churchman, 1968, 1971). Furthermore, these newer synthetic approaches do not presuppose previous reductionistic steps, or at least not to the same level as in the past.

The synthetic technology described here, however, does presuppose previous reductionistic steps. Thus it is assumed that one of the previous methods has been utilized in order to break a large group of people down into a number of small groups and that each of the small groups has produced a different version of the issue and has come to a different set of proposed solutions. It is further assumed that the problem or issue under discussion does *not* admit of a single decomposition into separate problems. In fact, more often than not this realization occurs as a result of each of the small groups witnessing the perspectives of the others. One of the most important purposes of each of the previous methods is to create *dissatisfaction* with any particular (i.e., one-sided) approach to problem-solving. The purpose is to show explicitly that any single perspective is very likely to ignore important aspects of the problem.

The first step of the synthetic group technology consists of the selection of a representative from each of the small groups. Often this has already occurred earlier at the formation of the small groups. One person is typically selected as the recorder or leader of the group. (How the groups do this is an interesting topic in its own right. Suffice it to say that STs, for example, engage in a selection process very different from that of NFs. Whereas STs typically set up an impersonal selection mechanism such as voting, NFs select someone on the basis of personal charisma.)

Next, the representatives meet together as a new group, with each agreeing to argue the position of his group as forcefully as he can. (This step often takes place in view of the original groups.) Various debates take place simultaneously. After a specified period of time, the leader instructs and encourages the representatives to form a synthetic or integrated position if they can. That is, the representatives are encouraged to form a synthetic view that attempts to integrate as many of the elements of the pure or reductionistic positions as possible.

If the original participants are not satisfied with the resultant synthetic view, the process can go back or forward to any one of a number of possible steps:

1. The original participants can decide to disband because of inability to agree on a resultant policy, and they can recommend that an entirely new group take over and begin from scratch.
2. The original group can agree to pass on their unresolvable differences, or the dialectic between them, to a new group as the starting input to them.
3. The original group can agree to reconsider their differences and try to vote on a minimal compromise solution.
4. They can agree to keep trying different methods until they can come to a synthetic policy they can agree on; for instance, they can agree to set up a different representative group to debate the synthetic policy of the first group of representatives.

As we see shortly, there are many more options open. To explore these alternatives necessitates our leaving the behavioral technologies and discussing the technologies that arise from a consideration of the philosophic inquiry systems (ISs).

## PHILOSOPHIC SYSTEMS

In *The Design of Inquiring Systems,* Churchman (1971) embarks on a most interesting and exciting intellectual journey. His purpose is not to translate, for instance, Leibniz and Hegel from the German into English, but rather from the idiom of the 17th and 18th centuries into the 20th. Churchman's intent is to discuss five archetypal systems, the labels for them standing for the particular individual whose work seems most to capture the spirit of the system or who is most closely identified as the modern progenitor of the system. Thus the labels for the systems are not meant to be taken as *the* complete or exact embodiment of the work of the particular philosopher whose name they bear; rather, they are meant as much for purposes of differentiation than for historical association. Since these systems are described in detail elsewhere (Churchman, 1971; Mitroff, 1973), we describe them here in the briefest possible terms. Also, we first present them as methodologies, and then how we have adopted them as technologies.

*Lockean ISs*

Databanks, accounting, and statistics are basically examples of Lockean systems. Lockean ISs are the archetype of experimental, *consensual* systems. For any problem, they will build an empirical, inductive representation. They start from a set of elementary empirical judgments ("raw data," observations, and sensations) and from these build up a network of everexpanding, increasingly more general sets of "facts." [Whereas in a Leibnizian IS (below) the networks are theoretically, deductively derived, in a Lockean IS they are empirically, inductively derived.] The guarantor of such systems has traditionally been the function of human agreement; in other words, an empirical generalization is judged objective, true, or factual if there is sufficient widespread agreement on it by a group of "experts." A beautiful example of a Lockean IS is that of the Delphi method (Mitroff, 1973). The final information content of a Lockean IS is identified almost exclusively with its empirical content. Lockean ISs would seem to be best suited for working on well-structured problem situations for which there exists a strong consensual position on the nature of the problem. If the consensual position is suspect, no matter how strong it might be, Kantian and Hegelian IS may be called for (see below).

*Leibnizian IS*

Information derived from models or proved from axioms is Leibnizian in nature. Leibnizian ISs are the archetype of formal, symbolic systems. For any problem, they will build a formal mathematical or symbolic representation. They start from a set of elementary, primitive "formal truths" and from these build up a network of everexpanding, increasingly more general, formal propositional truths. The guarantor of such systems has traditionally been the precise specification of what shall count as a proof for a derived theorem or proposition; other guarantor notions are those of internal consistency, completeness, comprehensiveness, and so on. The final information content of Leibnizian ISs is identified almost exclusively with its symbolic content. Leibnizian ISs appear to be best suited for working on clearly defined (i.e., well-structured) problems for which there exists an analytic formulation with a solution. Operations research is a field stressing the Leibnizian evidence-generating approach. A single "best" model is developed, and its conclusions are communicated to decision makers.

*Kantian ISs*

Kantian ISs are the archetype of *multimodel,* synthetic systems. (Kant, of course, stresses the role of a single *a priori* model that he called the "categories" in perceiving reality. For the neo-Kantian this suggests that the real problem is determining which among several alternative models is best for perceiving reality.) On any problem, they will build at least two alternate representations or models of it. (If the alternate representations are complementary, we have a Kantian IS; if they are antithetical, we have a Hegelian.) The representations are partly Leibnizian and partly Lockean; that is, Kantian ISs make explicit the *strong interaction* between *scientific* theory (the *a priori*) and data. They show that in order to collect some scientific data on a problem *a posteriori,* one *always* had to presuppose the existence of *some* scientific theory *a priori,* no matter how implicit and informal that theory may be. Kantian ISs presuppose *at least two* alternate scientific theories (this is their Leibnizian component) on any problem or phenomenon. From these alternate Leibnizian bases, they then build up *at least two* alternate Lockean fact nets. The hope is that out of these alternate fact nets or representations of a decisionmaker's or client's problem, there will be one that is "best" for representing his problem. The defect of Leibnizian and Lockean ISs is that they traditionally give only one view of the problem. Kantian ISs attempt to give many *explicit* views. The guarantor of such systems is the degree of fit or match between the underlying theory (theoretical predictions) and the data collected under the presumption of that theory. Since in a Kantian IS information is neither purely theoretical nor experimental, the final information content is a function of both. It may be that Kantian ISs are best suited for handling problems of "moderate" ill structure. Problems that are "wickedly" ill-structured would seem to be best handled by Hegelian ISs.

*Hegelian ISs*

Hegelian or Dialectical ISs are the archetype of *conflictual,* synthetic systems. For any problem, they build *at least two completely antithetical,* representations. Hegelian ISs start with either the prior existence (identification) of, or the creation of, two strongly opposing *(contrary)* Leibnizian models of a problem. These opposing representations constitute the contrary underlying assumptions regarding the theoretical nature of the problem. Both of these Leibnizian representations are then applied to the *same* Lockean data set in order to demonstrate the crucial nature of the underlying theoretical assumptions. They make the point that the *same* data set can be used to support either theoretical model. This is because data are *not* information; information results from the interpretation of data. It is proposed that out of a dialectical confrontation between opposing interpretations (e.g., the opposing "expert" views of a situation) the underlying assumptions of both Leibnizian models (or opposing policy experts) will be brought to the surface for conscious examination by the decisionmaker who is dependent on his experts for advice. As a result of witnessing the dialectical confrontation between experts or models, one would hope that the decisionmaker will be in a better position to form his own view (i.e., build his own model or become his own expert) on the problem that is a "creative synthesis" of the two opposing views. [For a case study of the process, see Mason (1969); for a theoretical model (i.e., for a Leibnizian model of a dialectical IS), see Mitroff (1971); and for a treatment of decision theory from a dialectical point of view, see Mitroff and Betz (1972)]. In contrast to the Lockean IS in which the guarantor is agreement, in the Hegelian the guarantor is intense conflict, with the presumption that conflict will expose the assumptions underlying an expert's viewpoint that are often obscured *precisely because of* the agreement between experts. Hegelian ISs would seem to be best suited for "wickedly" ill-structured problems. Precisely because of their ill-structure, there will be intense debate over the "true" nature of "wicked" problems. Conversely, the Hegelian IS would not appear to be well suited for well-structured, clearcut problems. For these, conflict may be a time-consuming nuisance.

*Singerian–Churchmanian ISs*

Singerian–Churchmanian ISs are the most complicated and, hence, the most difficult to describe. We must of necessity refer the reader to the literature (Churchman, 1971; Mitroff, 1973, 1974) for an explication of their properties. In general, however, Singerian ISs involve continual learning and adaptation through feedback. They do this by converting "wicked" problems into "structured," and "structured" problems into "wicked." Too much agreement in the data leads to asking more refined questions, and too little to asking more general questions. Singerian inquiry shows how Leibnizian and Lockean ISs can be modified to work on "wicked" problems. Thus all of the ISs again become applicable for all classes of problems and hence independent of one another; how the Singerian ISs do this is a most fascinating story that must be left to Churchman's book, *The Design of Inquiring Systems* (1971). For this reason, it would appear that Singerian ISs are best suited for studying all of the other ISs.

We have translated each of these systems into a technology via the following. A brief lecture is given on the nature of these systems as in the preceding descriptions. Next the group is either given an open-ended problem, that is, a problem that is inherently capable of being treated by each system, or they are already faced with such a problem. The group is then told in turn how a Lockean IS (etc.) would approach the problem.

It is explained that the Lockean group would pay primary attention to the data in the problem situation and ignore the theoretical aspects. They are to attempt to arrive at a *single* definition of the problem and a *single* solution to it based on the *strongest possible consensus* that can be produced by their group. Conversely, the Leibnizian group would pay primary attention to the theoretical aspects of the problem and ignore the data. It is, in fact, stressed that the Leibnizian group would first attempt to build on or locate a previously developed theoretical model and impose it on the situation. The theoretical model would not only guide how the data in the problem situation is to be treated, but what data is to be treated, if any.

The Kantian group is instructed to pay equal attention to both the data and the theoretical aspects of the problem. They are also told to bring a number of different theoretical perspectives and models to bear on the situation and to show explicitly how both the definition of the problem and its proposed solution change as the theoretical representation of the problem is varied.

The Hegelian group is instructed to create a dialectic with regard to the situation. They are instructed to create the strongest possible case for a particular interpretation of the situation, and then, the strongest possible case for a contrary interpretation. They are finally asked to arrange for a dialectical presentation whose purpose is to debate explicitly the merits of both representations of the problem situation.

Lastly, the Singerian group is instructed in all of the previous technologies and asked to choose at least two of them in terms of which to analyze the problem situation. They are also asked to seek and to recommend, if they can, a synthetic view of the problem. Of all of the groups, the Singerian is the most synthetically oriented.

After each of the ISs has been explained as a theory and as a working technology, the individuals are assigned or assign themselves to one of the IS groups to work on the problem. A most interesting question concerns how they should be assigned to the IS groups. One answer is by means of either the ISs themselves or the behavioral systems described earlier. For instance, there is nothing to prohibit the use of the *ad hoc* technology to assign people at random to the various ISs. Indeed, this brings us to the central concern of this chapter, namely, the relationships between the various systems described thus far. How does (or how can) each of the systems impact on one another? And, what does the nature of these impacts have to teach us about problem-solving?

## TWO MATRICES OF SOME POSSIBLE INTERACTION EFFECTS

Tables 1 and 2 represent an attempt to indicate how each system we have described can potentially impact on one another. Since it is important to discuss at least two different interpretations of impact, Tables 1 and 2 illustrate two different forms of the term.

Table 1 considers what happens as we move from an initial state represented by one system to a secondary state represented by another. Table 1 is thus concerned with what happens as a group undergoes a transformation from one system (state) to another system (state).

If one likes, one can think of each system as an initial stimulus, and each transformation as a response to the stimulus (Mitroff and Sagasti, 1973). The reasons for thinking this way are as follows:

1. The stimuli that we are presented with in everyday life are vastly more complicated than the "simple" ones found in the typical laboratory; likewise, the repertoire of responses available to us are also more complicated. In order to construct a more adequate theory of man that does justice to his complex nature, we believe it is necessary to deal with more complex stimuli and how man responds to them; in sum, we need a taxonomy of more complex stimuli and responses.
2. The transformations between systems are themselves instructive; they provide an interesting way to view some old familiar social process and shed light on some unfamiliar ones.

Table 2, on the other hand, captures a different sense of the term "impact," showing what happens when each system acts as a modifier or shaper of another system. That is, one sense of impact is when a system is transformed into another. Another sense occurs when one system acts on another to shape it but where the first system still retains its identity. The

*Table 1.* System Transformations

*Behavioral Systems*

| *Behavioral systems:* | *Ad hoc* | MAPS | Jung | Interest | Synthetic |
|---|---|---|---|---|---|
| *Ad hoc* | Randomness preserving, reinforcing | Task and social ordering | Values clarification, psychological ordering | Political ordering, politicization | Integrative ordering |
| MAPS | Task and social dissolution | Task and social reinforcing | Task and social psychological clarification | Task and social politicization | Task and social integration |
| Jung | Values or personality dissolution | Depersonalization through task and social ordering | Values heightening personality reinforcing | Depersonalization through politicization | Personality integration |
| Interest | Randomness depolitization | Task and social depolitization | Value clarification depolitization | Politicization reinforcing | Integrative depolitization |
| Synthetic | Disintegration through randomization | Disintegration through task and social specialization | Disintegration through personality specialization | Disintegration through politicization | Integrative reinforcing |
| *Inquiry systems:* | | | | | |
| Lockean | Consensus dispersing | Task and social specialization of consensus | Social psychological awareness of consensus | Class-conflict creating | Integrative consensus |
| Leibnizian | Reason dispersing | Task and social specialization of reason | Social psychological basis of reason | Politicization of reason | Integrative reasoning, broadening of rationalism |
| Kantian | Synthesis dispersing | Task and social basis of synthesis | Social psychological basis of synthesis | Politicization of synthesis | Integrative broadening of synthesis |

(*Table 1. cont.*)

| | | | | | |
|---|---|---|---|---|---|
| Hegelian | Conflict dispersing conflict reduction | Task and social conflict reduction | Social psychological basis of conflict | Conflict politicization | Integration of conflict |
| Singerian | Systemic dispersing | Task and social systemic decomposition | Personality systemic decomposition | Political systemic decomposition | Systemic reinforcing |

*Inquiry Systems*

| | | | | | |
|---|---|---|---|---|---|
| *Behavioral systems:* | Lockean | Leibnizian | Kantian | Hegelian | Singerian |
| *Ad hoc* | Consensus forming | Rational reconstruction, reason forming | Synthetic creating | Conflict ordering | Systemic ordering |
| MAPS | Task and social consensus | Rational reduction of task and social diversity | Synthetic ordering of task and social specialization | Conflict generation with regard to task and social specialization | Systemic integration of task and social specialization |
| Jung | Consensual depersonalization | Reason-dominated depersonalization | Synthetic personalization | Dialectical personalization | Systemic personalization |
| Interest | Consensual depoliticization | Reason-dominated depoliticization | Synthetic depoliticization | Dialectical politicization | Systemic depoliticization/ politicization |
| Synthetic | Consensual reductionism | Reason dominated reductionism | Pluralistic synthesization | Conflict generation | Systemic integration |
| *Inquiry systems:* | | | | | |
| Lockean | Consensus reinforcing | Rationalistic conversion | Synthetic conversion | Conflict generation | Systemic conversion/awareness |

| | | | | | |
|---|---|---|---|---|---|
| Leibnizian | Empiricistic conversion | Reason reinforcing | Synthetic conversion | Conflict generation | Systemic conversion/awareness |
| Kantian | Consensual synthetic reduction | Rationalistic synthetic reduction | Synthetic perpetuation | Conflict generation | Systemic conversion'/awareness |
| Hegelian | Consensual conflict reduction | Rationalistic conflict reduction | Synthetic conflict reduction | Conflict perpetuation, dialectic reinforcing | Systemic integration of conflict |
| Singerian | Empirical reductionism | Rationalistic reductionism | Synthetic reductionism | Dialectical reductionism | Systemic perpetuation, systemic inquiry into systems thinking |

*Table 2.* System Modifications

*Behavioral Systems*

| *Behavioral systems:* | *Ad hoc* | MAPS | Jung | Interest | Synthetic |
|---|---|---|---|---|---|
| *Ad Hoc* | Unstructed randomness | Qualitative MAPS | Qualitative Jung | Qualitative interest | Qualitative synthetic |
| MAPS | Task and socially structured randomness | $MAPS^2$ | MAPS Induced Jungian groups | MAPS Induced politicization | MAPS Induced integration |
| Jung | Psychologically induced randomization | Singerian psychological MAPS | $Jung^2$ | Jungian psychological politicization | Jungian psychological integration |
| Interest | Political randomization | Political MAPS | Political psychology | $Interest^2$ | Political integration |
| Synthetic | Integrative randomization | Integrative MAPS | Integrative psychology | Integrative politicization | $Synthetic^2$ |
| *Inquiry systems:* | | | | | |
| Lockean | Consensual randomization | Data-dominated MAPS | Consensually dominated Jung | Consensual politics | Consensual integration |
| Leibnizian | Reason-induced randomization | Formally dominated MAPS | Reason-dominated Jung | Rational politics | Rational integration |
| Kantian | Synthetic randomization | Synthetic MAPS | Synthetic Jung | Synthetic politics | Synthetic integration |
| Hegelian | Conflict-induced (dialectical) randomization | Dialectical MAPS | Dialectical Jung | Dialectical politics | Dialectical integration |
| Singerian | Systemic randomization | Systemic MAPS | Systemic (integrated) Jung | Systemic politics | Systemic integration |

*(Table 2. cont.)*

***Inquiry Systems***

| *Behavioral systems:* | Lockean | Leibnizian | Kantian | Hegelian | Singerian |
|---|---|---|---|---|---|
| *Ad hoc* | Informal Lockean | Nonformal rationalism | Nonformal synthetics | Nonformal dialectics | Nonformal systemics |
| MAPS | MAPS-Designed empiricism | MAPS-Designed rationalism | MAPS-Designed criticism | MAPS-Designed dialectics | MAPS-Designed systemics |
| Jung | Jungian psychological empiricism | Jungian psychological rationalism | Jungian psychological synthesis | Jungian psychological dialectics | Jungian psychological systemics |
| Interest | Political empiricism | Political rationalism | Political synthesis | Political dialectics | Political systemics |
| Synthetic | Integrative empiricism | Integrative rationalism | Integrative synthesis | Integrative dialectics | Integrative systemics |
| *Inquiry systems:* | | | | | |
| Lockean | $E^2$ Empirical empiricism | Empirical rationalism | Empirical synthesis | Empirical dialectics | Empirical systemics |
| Leibnizian | Rational empiricism | $R^2$, Logical logicism | Rational synthesis | Rational, formal dialectics | Formal systemics |
| Kantian | Synthetic empiricism | Synthetic rationalism | $S^2$, Synthetic criticism | Synthetic dialectics | Synthetic systemics |
| Hegelian | Dialectical empiricism | Dialectical rationalism | Dialectical synthesis | $D^2$, Dialectical dialectics | Dialectical systemics |
| Singerian | Systemic empiricism | Systemic rationalism | Systemic synthesis | Systemic dialectics | $S^2$, Systemic pragmatism |

first system is still visible in its essential outline but the second deforms it to emphasize a particular property of the first. The particular property emphasized depends on the special character of the second system—the system doing the emphasizing.

For each of the 200 cells in Tables 1 and 2 we have supplied a generic label or a brief phrase descriptive of the basic social process taking place between the systems. In each case we have tried to select a label or phrase that is evocative in the sense that it seems to capture the essence of a basic and important social process.

Given the large number of cells, it would be impossible in a limited chapter to give each cell the discussion it deserves. Thus we have chosen to concentrate our discussion on a few of the cells and in this manner convey the spirit of our overall intent. A previous paper (Mitroff and Sagasti, 1973) treats in detail the 25 IS cells located in the extreme lower right-hand corner of Table 1. It discusses the meaning of the ISs considered first as stimuli and then as responses, and the reasons for the labels assigned to the cells.

Each cell in Tables 1 and 2 is intended to connote a characteristic and distinct form of a higher-order problem-solving technology that can be constructed out of the five basic behavioral and five IS technologies. Each of these 10 technologies can interact with one another to form at least 100 different interactions as given in Tables 1 and 2. If we identify the essence of the *ad hoc* technology with "randomness," the MAPS with "social + task ordering," the Jungian with "psychological differentiation or ordering," the interest with "politicization, political ordering, or political differentiation," and the synthetic with "integrative ordering or nondifferentiation," then the task of conveying the spirit of the cells is considerably simplified. The same is true if we identify the essence of the Lockean IS with "consensually based empiricism," the Leibnizian with "formal reason or rationalism," the Kantian IS with "synthesis or the integration of rationalism with empiricism within a multiperspective," the Hegelian IS with "conflictually based or dialectical inquiry," and finally, the Singerian IS with "systematic reasoning," that is, with nonreductionistic, nondisciplinary (transdisciplinary) reasoning, or the systems approach in its broadest possible sense (Ackoff, 1974; Churchman, 1971).

The cell in the extreme upper left-hand corner of Table 1 *(ad hoc–ad hoc)* is meant to indicate the condition where one initially starts out in an *ad hoc* problem-solving group and at the end of the first round or phase of problem-solving remains in an *ad hoc* problem-solving group (although it need not be in the initial *ad hoc* group). Thus, for example, if one were using the *ad hoc* problem-solving method in an attempt to achieve a final integrative solution but was unable to do so for the reasons discussed earlier, one might very well find oneself in a new *ad hoc* group or position at the start of the second round. We have called this state-transition process a "randomness preserving or reinforcing" condition for obvious reasons. This label captures for us the essence of this process.

One of the major features of Tables 1 and 2 is that they illustrate the variety of distinct social processes (means) that exist (and which are usually undifferentiated from each other) for achieving a commonly recognized social condition (end). Thus, for example, the condition "politicization" can be achieved in a variety of ways. We find it useful to differentiate task + social politicization (MAPS to interest) from disintegrative politicization (synthetic to interest). Both of these forms represent a distinct manner of increasing political awareness, of forming persons into differentiated political groups. For purposes of greater social analysis, it seems important to ascertain which kind of social organization preceded politicization. It seems to us that the social sciences cannot continue to ignore such differences and yet aspire to greater understanding in the area of human affairs. If a greater precision in measurement is ultimately to be our fate (assuming that this is desirable, which we do not without grave reservations, since to pursue this aim exclusively would be to subordinate all inquiry to that of Leibnizian and Lockean forms), then it must be preceded by a greater precision in concepts, and not merely in techniques and tools as ends.

In the same spirit, it is important to differentiate between the different forms of conflict generation that Table 1 uncovers. In a sense, all of the cells under the column labeled "Hegelian" represent a distinct form of conflict generation. The differences between the forms arise by considering what preceded the creation of the conflict. In every case, we have the breakdown of a previously ordered group into a set of conflicting groups. Even more important to note is that Table 1 stresses explicitly that conflict generation is just as important a social problem solving process as its opposite conflict, reduction. As we indicated in our earlier discussion of the ISs, some problems require conflict, and not consensus, as a fundamental epistemic principle of attack.

For the purposes of this chapter, some of the most interesting cells in Table 1 concern the interactions between the behavioral and philosophic systems. These represent the areas where we believe the social sciences and philosophy have the most to contribute to one another. Consider, for example, the cell Hegelian IS to Jung. We have labeled this process the "social psychological basis of conflict," for it seems to us that this condition gets at the social psychological factors underlying an initial state of extreme conflict—dialectical conflict. By splitting a group experiencing dialectical conflict into pure personality groups, we have a chance to study what proportion of the original conflict is due to personality factors and hence amenable to personality or values clarification, that is, what proportion of the conflict can be resolved through an understanding of the personality factors underlying it. Conversely, the reverse process of Jung to Hegelian represents a condition of dialectical personalization or of personality conflict—the creation of a condition of dialectical conflict between the Jungian personality groups for problem-solving. In fact, this condition represents one of the major steps embedded in the Jungian technology itself. The cell Jung to Hegelian brings this out in an explicit manner.

As a further example of the meaning of Table 1, consider the cell Hegelian to MAPS. This cell is meant to indicate that if the transition is successfully accomplished, conflict reduction is said to occur through an application of the MAPS design technology. The conflict is, at a minimum, dispersed, and optimally, resolved through a structuring of people and tasks into homogeneous clusters.

Table 2 presents a different but related series of concerns. First of all, the diagonal cells represent pure reflective or introverted activity—the application of the technologies back on themselves for further purification. Consider for instance, the cell designed by $Jung^2$ (the Jungian technology applied to the Jungian technology). The initial application of the Jungian technology sorts the members of a group or organization into relatively pure Jungian groups. This is not to say, however, that everyone in every group is at the same level of intensity with regard to personality differences. A second or further application of the Jungian technology to *each* of the original Jungian groups typically results in even more extreme or pure personality groups. Thus extreme STs would be differentiated (and/or created) from more moderate STs, and so on. Whether this is advisable must await further empirical exploration, since there are strong theoretical reasons for doubting this procedure (Jung, 1923). The creation of extreme personality types is not something to be tampered with lightly, as Jungian theory postulates that modern man already suffers too much from personality differentiation in the sense of being one-sided or narrow in his development. Further contributing to this one-sidedness would be antithetical to the theory, since it would be taken as contrary to one of the most basic aims of the theory—the further *integration,* not disintegration, of the human psyche.

The preceding comments apply in a slightly different fashion to each of the remaining diagonal or pure cells. The cell labeled $R^2$ we take to be almost synonymous with pure introverted rationalism—reason turning back and feeding endlessly upon itself. We are tempted to categorize this approach as all too typical of philosophic problem-solving in the most narrow of disciplinary senses. This approach often takes the form of attempting to cast everything as a logical problem, that the problem (whatever it is) would only be better solved if we only applied logic better, and that the solution of a problem is ultimately dependent on finding *the* true and precise definition of it.

Again, for our purposes, the interactions between the behavioral and the philosophic systems are of most interest. Here as well, the diagonal cells within a block prove to be of special interest. Therefore, consider the cells Lockean–*ad hoc*, Leibnizian–MAPS, Kantian–Jung, Hegelian–interest, and Singerian–synthetic. We would contend that these cells represent the most natural pairings between the behavioral and philosophic systems. To take but two examples: while there are a number of key elements in MAPS deriving from a number of developments in many disciplines (in the sense that MAPS could not have been possible without them), the central element is undoubtedly that of multivariate analysis. Leibnizian–MAPS emphasizes this core feature of MAPS; it stresses the formal, analytic side of the procedure over all others. The Kantian–Jung cell emphasizes the essentially multiperspective nature of the Jungian group technology. It would take us too far afield to illustrate even further the Kantian nature (as we have defined the term) of this technology. Suffice it to say that the Jungian group method presupposes the strong interpretation between the theory of the method, the particular kind of data collected under it, and the uses to which the data are put.

The remaining cells in the lower right-hand block of 25 philosophic–behavioral systems represent alternate (off-diagonal) and not intuitively obvious senses of the behavioral technologies. For example, if Leibnizian–MAPS gives primary emphasis to the mathematical aspect of MAPS, then Lockean–MAPS gives primary emphasis to the data or empirical-input side. If Leibnizian–MAPS gives primary emphasis to the continued development of the factor analytic routines, Lockean–MAPS gives primary emphasis to the continued development of the data-input questionnaires. Synthetic–MAPS emphasizes that both of these aspects are incomplete and one-sided without the other and in need of equal development.

Finally, we come to one of the most important aspects of the taxonomy. This concerns the set of 25 cells in the upper right-hand corner of Table 2. Each of these cells is meant to indicate that there is a fundamental design problem connected with each (in our brief list) of the philosophic systems and that this problem can be approached in at least as many ways as we have available behavioral systems. To see this it is necessary only to consider the cell MAPS–Leibnizian. Classical rationalism is individualistically oriented in character. It considers the individual as the self-sufficient center of philosophic thinking. It does not ask what are the appropriate set of social and task conditions necessary to promote *organizational* reason. It does not ask how can we bring the appropriate people together to work on the appropriate set of subtasks necessary to design a rationalistic inquiry system. Indeed, such a question does not even occur in classical rationalism. For us, it is an appropriate question for modern inquiry.

## CONCLUDING REMARKS

We have tried to outline a different and, we hope, newly emerging role for the social sciences and philosophy. We sincerely hope it is a role that promotes greater interdisciplinary understanding and cooperation. Our basic method is vitally dependent on such cooperation. Not a single one of the methods outlined in this chapter could have arisen in a singularly disciplinary environment. Another way to put this is to say that while many, if not all, of our methods are indebted to the disciplines for their inception, the disciplines have only been necessary for this at best, and not sufficient for their continued growth and development.

It is highly pertinent to note in this regard that the methods outlined here only constitute a very small proportion of the full extent of problem-solving technologies that appear possible. Our effort is only meant to be suggestive, not complete. We could have very easily talked of technologies drawn from every single one of the social sciences. For instance, one can easily envisage anthropological and socioeconomic technologies. The former would group problem-solvers in terms of the different cultural interests they represented and the latter, in terms of different socioeconomic interests.

In *The Design of Inquiring Systems,* Churchman (1971) has outlined a conception of inquiry such that each of the disciplines now (and likely to be) in existence presupposes and is presupposed by all of the others. Under this conception, the different disciplines may at best only be *construed* as independent and autonomous of one another. Each can be shown to be fundamentally dependent on *all* of the others for its basic functioning and at least one of its basic concepts. Essentially each discipline is dependent on the others through what each discipline takes as a "given" beyond the purview of its methods and concerns. What Churchman has done is to outline a concept of inquiry that need not depend on any basic way on the presumption of *fixed, unquestioned,* or *unquestionable* givens. While it is unfortunately beyond the scope of this chapter to examine the consequences of this for our topic, we can say that Churchman truly points the way to an expanded theory of problem-solving.

In a sense, this only brings us back to the initial starting point of our inquiry—to what discipline or collection of disciplines we can (or must) turn to make all of the disciplines more aware of their need for one another. In our view, the major problem standing in the way of effective social problem-solving is the disciplines themselves. Problems such as abortion, pollution, and energy, are not disciplinary problems. They are systematic problems. To paraphrase Ackoff (1974), natural problems are not constituted in the same ways that the problems of the universities are. Real problems are systemic in nature, not disciplinary.

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