Human Relations, Volume 36, Number 1, 1983, pp. 1-22

A Dialectical Approach to Formulating and Testing Social Science Theories: Assumptional Analysis

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It is argued that the necessary step in the formulation of "good" theories and their subsequent testing and refinement is uncovering the relevant underlying assumptions that different scientists make concerning the nature of human behavior, social environments, and the interactions between these. Since assumptions are, by definition, implicit, unconscious, or even obscure, an explicit process is needed to examine this hidden domain. This paper presents such a process and illustrates how this dialectical approach can be utilized to facilitate advances in social science research.

INTRODUCTION

If one were to review the major contributions and breakthroughs in the history of a social science paradigm, it would be apparent that at each stage of development, a prior assumption was challenged and then rejected. In fact, one can suggest that a particular paradigm remains in a static state of existence precisely because its critical aspects are assumed correct by most or all researchers. For a time, then, research studies add nothing new to our understanding—merely the obvious gets stated and tested all over again. Not until someone exposes some underlying assumption as needing investigation by suggesting that a very different or even an *opposite* assumption is closer to "the truth," does the research effort regenerate excitement, controversy and significant movement.

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0018-7267/83/0100-0001$03.00/1

It is possible to cite many examples of this process. Consider in a very broad way, the development of organization theory during the past century. Starting with the work of Max Weber (1947), the concept of social organization in the late 1800s assumed that man was driven by economic and security needs alone, and that an efficient organization easily could exclude all other parts of man's personality and life. Early management theorists such as Frederick Taylor (1911), and the time and motion studies of Gilbreth (1914), continued in this tradition. The paradigm of organization theory/behavior was first revolutionalized by the now famous Hawthorne studies (Roethlisberger & Dickson, 1938). Researchers discovered, quite by accident, that workers seemed to have social needs: needs for attention and social support. In fact, it was only by questioning the assumptions of "economic man" that Roethlisberger and Dickson could explain the perplexing results that reduced lighting improved worker performance. It was, apparently, the special attention that the researchers paid to the workers that motivated the latter to work harder in spite of the dimmer surroundings.

For the next few decades, the human relations movement continued to research the issues of social motives, worker satisfaction, support climates, and the like. But some researchers began to question the heavy reliance placed on social motives alone, not just because economic and security needs were being ignored, but it seemed that additional concepts were needed to explain *productive* behavior at the work place. Research sought to tie worker satisfaction and social motivation more directly to performance measures and results. The Tavistock Institute (e.g., Trist & Bamforth, 1951) and the Institute for Survey Research (e.g., Katz & Kahn, 1952, pp. 650-665), emphasized this approach in the 1950s.

One clear "breakthrough," however, took place in the late 1950s by the work of March and Simon (1958). These researchers, while acknowledging the nature of man as motivational (affective), presented organization theory as being explained more accurately by man as a cognitive being or as an information processor. This new perspective led to extensive research on managers as decision-makers, as "satisficers" rather than optimizers, and as operating under conditions of uncertainty and turbulent decision environments—quite at variance with traditional economic and behavioral assumptions. Extensively cited works in the 1970s such as Thompson (1967), Weick (1969), and Galbraith (1973), all explicitly followed the information-processing/decision-making approach.

It is not evident what the 1980s will hold concerning the challenging and the testing of other critical assumptions about man, including implications for organization theory. But it does seem apparent that directly examining the critical assumptions (to be explicated shortly) will not only help to pinpoint needed research activity but might even help to accelerate

the progress of knowledge development in this and other social science fields. (The same also may apply to the physical and biological sciences, but these domains will not be considered at this time.) This paper first presents a theory of "assumptional analysis," followed by a behavioral process that seeks to operationalize this dialectical approach for a variety of problem situations. Then it will be suggested how this theory and method can be applied to the scientific "problem" of formulating and testing social science theories. With some experience and understanding of how assumptional analysis works in "real" organizational settings, the author will provide a hypothetical illustration of the process if it were applied to a representative collection of social scientists.

ASSUMPTIONAL ANALYSIS

In a series of articles (Mitroff & Emshoff, 1979; Mitroff, Emshoff, & Kilmann, 1979; Kilmann, 1979), a theory and process have been developed for uncovering the critical assumptions underlying any statement, argument, or conclusion. Hereafter, reference will be made to "conclusion," which denotes any sort of evaluation, decision, policy, judgment, proposal, etc., representing a derived outcome, no matter how tentative or whether or not it was developed by individual or collective action.

An assumption is defined as any related "element" to the conclusion which must be true in order to logically derive (deduce) the validity of the conclusion. By element is meant any condition, property, characteristic, belief, structure, process, etc., that can exist or take place within individuals (as personality dynamics and states) or between individuals (as norms, styles of interacting, rules, procedures, goals, and so on). Essentially, an assumption is *all* the things one has to "take for granted" and consider as true—about people, their environments, and the interactions between the two—so that one can argue most strongly that the conclusion as stated is correct, desirable, most appropriate, and the best thing to do.

Assumptions by their very nature remain implicit, unconscious, or obscure simply because so much has to be taken for granted in order to draw any conclusions about anything—especially when complex matters are being considered. For example, in order for someone to argue that a particular theory about human nature is the most valid, one has to assume at least the following: that human nature can be studied, that people have certain stable characteristics which do not change moment-by-moment, that such characteristics can be observed and measured in a reliable and valid form even if these are stable, that scientists as people can study themselves by the same methods that are used for studying physical phenomena, that

perception of events is the same as actual events, that "human nature" will not change the more it is studied, and the like. One could generate literally tens if not hundreds of assumptions that would have to be true to entertain any theory about how people behave, and then to be able to study the selected behavior empirically. While most of the assumptions as stated would be met with, "Of course that's true, ... or that seems reasonable," if the assumptions are not made explicit, they cannot be questioned or tested.

Herein lies the major point of this paper: we, as social scientists, should not assume that all assumptions if made explicit would be considered valid, obvious, or even reasonable. Rather, we should surface and examine the most critical assumptions in any scientific pursuit (if not "all" the assumptions) since these assumptions get at the heart of whether one's theories (tentative) conclusions are reasonable and valid for the time being. As will be evident shortly, it would seem that the assumptions underlying theories are the things to test rather than the theories themselves! "Initial" theories are just a first step for getting at key assumptions.

The issue, then, is how to uncover assumptions and, particularly, how to get at the most critical assumptions for any conclusion—not all assumptions are of equal importance and thus do not have an equal bearing on a conclusion. The first stage of the analysis, stakeholder analysis, is to generate a list of all or most assumptions affecting a conclusion. The second stage, belief-assessment analysis, is to evaluate these assumptions according to some criteria of importance or centrality. The third stage, conclusion analysis, is to reexamine and perhaps modify the initial conclusion once the critical assumptions have been exposed, then validated or altered.

Stage I: Stakeholder Analysis

Generating assumptions for any conclusion can be done by defining all the potential individuals or groups or organizations (any collection of individuals) who may affect or be affected by the conclusion, and therefore have a *stake* in the validity of the conclusion, as stated. Rather than developing an itemized list (where several hundred if not thousands of individuals are involved), *categories* of persons, groups, etc., can be suggested. Determining these categories is a very important part of the process and the principles of taxonomy and classification should be applied in an appropriate manner (e.g., independent, mutually exclusive and exhaustive categories). Typically, a workable number is five to fifteen categories, where each category becomes a particular stakeholder to the conclusion.

For each stakeholder, a list of assumptions is developed to reflect what would have to be true about any and all aspects of the stakeholder in order to provide maximum support for the conclusion. Each assumption is stated in a form purposely to maximize this support, no matter how obvious or, alternatively, ridiculous the assumption may seem. The "truth" of each assumption will be investigated later. For the moment, assumptions are stated concerning the attitudes, beliefs, values, decision styles, information processing, norms, roles, personality characteristics, thought processes, and culture; in short, any attribute or process of the stakeholder that may have a relationship to the validity of the conclusion.

If, for example, ten assumptions are developed for each of 10 stakeholder categories, then 100 assumptions are available for analysis. It should be stated that the primary reason for the stakeholder analysis is not to classify people and groups for its own sake, but to generate assumptions. In particular, the objective is not to *miss* making assumptions about any relevant individual or group. First attempting to develop a comprehensive list of stakeholders is expected to minimize this likelihood. At least it seems more efficient as well as effective to approach assumptions through stakeholders instead of trying to uncover assumptions without regard to their source.

Stage II: Belief-Assessment Analysis

Once the many assumptions that stem from the stakeholder analysis have been generated, it is necessary to analyze these according to some criteria of importance or centrality. Saaty (1980) has developed a mathematical methodology that is especially useful for this *belief-assessment analysis*—pairwise comparisons of objectives, goals, means, assumptions, objectives, and so on. For present purposes, however, it is sufficient to consider this analytical framework for making assumption assessments.

Figure 1 shows the *assumption matrix* as defined by two dimensions: importance and certainty. Importance (less-important, more-important, most-important, relatively speaking) is the extent to which the assumption is central to the conclusion as stated. In other words, if the assumption is found invalid, how much would this alter one's ability to still argue forcefully for the conclusion. On the one extreme of less-important, would fall the assumptions that have a minimum effect on the conclusion. Thus, even if these were wrong, the conclusion could still be valid. On the extreme of most-important, are those assumptions which if found untrue would limit severely the credibility of the conclusion or even make the conclusion seem

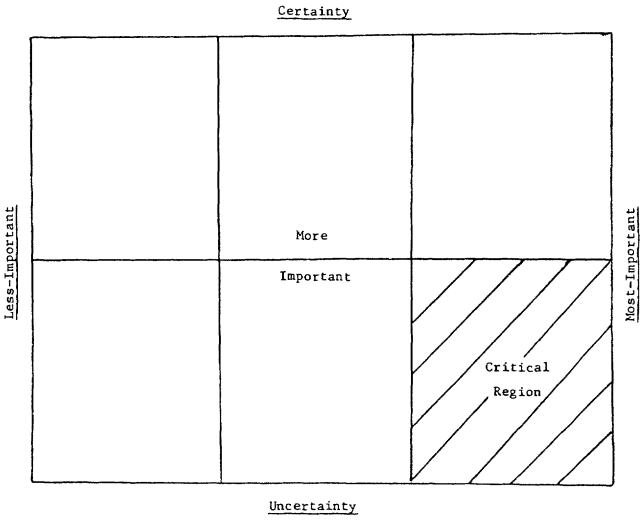

Fig. 1. Assumption matrix.

absurd. The "more-important" range would be intermediate between these extremes, in a relative sense.

Certainty, the other dimension of the assumption matrix refers to the confidence in the truth or falsity of the assumption, as stated. Complete certainty would suggest that it is known and fully accepted that the assumption is true or, alternatively, false. But either way, its validity (or lack, thereof) is clear or even "factual." Complete *un*certainty would indicate that one has absolutely no idea as to whether or not the assumption is true or false. Stated differently, complete uncertainty signifies that the subjective probability of an assumption being true is 50% and being false is 50%. As the subjective probability moves away from the 50/50 split (toward 100% or 0%), the certainty of truth, or corresponding falsity, increases.

The objective of belief-assessment analysis is first to sort all the assumptions generated by the stakeholder analysis into the appropriate cells of the matrix. Then the focus is on the assumptions that have been placed in the important/uncertain region. It might be said, in fact, that the main reason for going through this whole analysis is to uncover assumptions in this problematic area. Specifically, an assumption that is both "most-important" and "completely uncertain" is *the* foundation upon which the conclusion rests, and yet it is not all clear whether this assumption is either true or false. If, for example, the conclusion requires the

assumption to be true in order for the conclusion to be highly credible -- it could just as likely turn out that the assumption is false, thereby negating the conclusion entirely! Consequently, the strength of an argument for any conclusion (i.e., judgement, decision policy, hypothesis, theory, etc.) rests firmly on: (1) the existence of one or more assumptions in the important/uncertain region, and (2) whether the truth or falsity of these assumptions actually supports the conclusion as intended.

The other regions in the assumption matrix play a lesser role in assumptions analysis. The two regions representing less-important/certain and less-important/uncertain assumptions largely can be ignored since these have little impact on the conclusion, whether or not they are true or false. The two regions of more-important assumptions might have some impact in an accumulative manner, but do not have as much impact as the important/uncertain region. Finally, even the important/certain region is not as critical simply because it is known that the assumption as stated is true or false. It is not likely, therefore, that any surprise will take place as evidence about the "real" validity of these assumptions becomes manifest. However, one reason for not discarding the assumptions outside the important/uncertain region has to do with the possibilities of things changing over time. An assumption that was once true can become false, and vice versa, just as the relative certainty of the assumption can change. Assumptions are potentially as dynamic as any conclusions—this is the nature of social science phenomena. It seems appropriate, therefore, to monitor assumptions from time-to-time even in those parts of the assumption matrix that first seem less critical.

Stage III: Conclusion Analysis

Now that the assumptions have been surfaced, do they support the initial conclusion? First, it is possible that having required all the assumptions to be stated in a form to provide maximum support for the conclusion, reveals assumptions (usually only implicit) that seem to be very much false. This is not as critical to assumptions located in the less-important or perhaps even in the more-important cells of the matrix. But if these occur in the most-important/certain cell then it argues strongly to reject the initial conclusion. These assumptions, it will be recalled, are central to the conclusion, but were found to be inaccurate when examined explicitly.

The second possibility is to uncover assumptions in the critical region (most-important/uncertain), which should then motivate persons to find out more about the validity of these assumptions before any action is taken

on the stated conclusion. In other words, if an important uncertainty has been revealed it is now possible to collect further data (from any type of source available, including scientific research). This additional information might "move" the assumption(s) toward the certain region or even *into* the certain region, although the assumption(s) may have to be modified as a result of the new information. The advantage in moving assumptions out of the important/uncertainty region is that one can argue both for the conclusion and for initiating action with more confidence. Alternatively, the new information may provide sound reasons to modify the initial conclusion—to develop a conclusion that is more plausible given the most up-to-date information on the assumptions behind the conclusion.

Naturally, conclusions and subsequent actions, of necessity, often must proceed without complete information or certainty on the identified assumptions. The best that can be done under these circumstances is to keep a current listing and assessment of the assumptions on the assumption matrix and to be willing and able to alter conclusions as changes occur in the certainty and importance of assumptions, as discussed earlier. This monitoring as well as adjusting also should take place with the stakeholder analysis, as new sets of individuals, groups, or organizations, etc., enter into the conclusion's domain. In this way, new assumptions would enter the matrix as new stakeholders emerge. This suggests that assumptional analysis needs to be an ongoing process of stating conclusions, examining assumptions, collecting new information, restating conclusions, reexamining assumptions, and so forth.

A BEHAVIORAL PROCESS FOR ASSUMPTIONAL ANALYSIS

Thus far, it has not been suggested how the three stages of stakeholder, belief-assessment, and conclusion analysis can be formulated into specific design and action steps. This is where use is made of interpersonal, group, and intergroup dynamics to develop a rich, comprehensive, and thorough assumptional analysis. The guiding assumption here is that the more that several if not many individuals are involved in the process, who can provide different yet relevant perspectives on the conclusions, stakeholders, and assumptions, the more likely the process will result in the most valid set of assumptions and conclusions. Conversely, if only one or a few persons participate, and each of these persons has the same or similar perspective, it is more likely that some significant set of stakeholders and assumptions would be overlooked or ignored—which could turn out to be the very assumptions that would have

Table I. The Stages and Steps of Assumptional Analysis

Stages (Theory)	
I.	Stakeholder analysis
II.	Belief-assessment analysis
III.	Conclusion analysis
Steps (Practice)	
1	Forming initial conclusions
2.	Designing groups around conclusions
3.	Performing group-assumptional analysis
4.	Performing intergroup-assumptional analysis
5.	Resolving and synthesizing assumptions
6.	Deriving synthesized conclusions

been rejected, or modified. Further, the use of group processes and intergroup debates provides more confidence that each assumption will be challenged and defended, equally and vigorously, much more so than if separate individuals (without group loyalities and sanctions) merely argued their own points of view. Groups are simply more "powerful" and comprehensive than individuals, as long as proper group process is achieved: effective leadership, communication conflict management, and so on (Shaw, 1971).

Table I summarizes the six principal steps that serve to operationalize the three generic analyses described earlier (stakeholder, belief-assessment, and conclusion analysis). The six steps are: (1) forming initial conclusions, (2) designing groups around conclusions, (3) performing group-assumptional analysis, (4) performing intergroup-assumptional analysis, (5) resolving and synthesizing assumptions, and (6) deriving the synthesized conclusion.

It should be emphasized that the six-step process to be described below only would be utilized for important and complex conclusions, not for unimportant and simple (well-defined) conclusions. The benefit has to be worth the cost of many peoples' time and energy, and only on complex issues would there be a need to examine the many underlying assumptions. Simple conclusions (addressing simple, well-defined problems), generally speaking, have only a few stakeholders (sometimes one) and a few assumptions. Most of the latter, people are willing to take as a given and not spend the time investigating, especially if the rather simple conclusion is not that important anyway. When the error of being wrong carries a substantial cost (hence, the conclusion is important), when there is uncertainty about the complexities involved, and when some amount of time is available before action must be taken (i.e., time to analyze assumptions), then it seems warranted to design and conduct the full behavioral process.

Step 1: Forming Initial Conclusions

What is very germane to the process is that several (e.g., three, four, or five) very different conclusions are constructed, and not just one or two (two is required as a minimum in order to establish a counter view). The basis for this follows from the Hegelian *dialectic* as a system of inquiry (Churchman, 1971). Basically, for complex, ill-defined problems, it is necessary to construct and then debate at least two very opposing views in order to uncover their underlying assumptions. Simple problems can be approached through modeling and/or concensus without the need to generate opposing viewpoints (Mason & Mitroff, 1973).

Often, a number of alternative, competing conclusions already are available and have been articulated many times in the past. Sometimes only one or two different conclusions have been voiced and it may be necessary to formulate additional viewpoints. In either case, drawing upon a wide and diverse set of individuals who represent different areas of expertise different experiences, different vested interests, different personality types or even different cultures, religions, and life styles, would assure that very different viewpoints are held on complex, ill-defined problems. In fact, just as the theory of assumptional analysis emphasizes the need to generate a comprehensive list of stakeholders so that any significant assumption is not likely to be missed, utilizing such a diversity of individuals tends to assure that several opposing views will be articulated and, subsequently, that a large set of stakeholders and assumptions will be developed.

While in theory it would be nice to have every possible viewpoint represented, generally this is not feasible. But as long as it is deemed that "sufficient" diversity is present (for example, 15-30 individuals representating three or four different disciplines), the process can commence. In most cases, since these individuals have not had prior experience with the concepts and methods of assumptional analysis, some time should be spent on educating them to this approach. Making assumptions explicit and then debating competing assumptions among groups, are not familiar processes even to those individuals with a substantial scientific or behavioral background. It seems that our educational system (at least in the United States) teaches concensus (agreed-upon knowledge) more than dialectics on extreme positions (minority views), and concentrates more on knowledge as such rather than on the assumptions behind this knowledge (Mitroff & Kilmann, 1978).

Given an initial, even vague, sense of the conclusion to be examined, individuals are asked to participate in the assumptional-analysis process. If this takes place in a single organizational setting, then it is rather easy to obtain participants from different departments, and hence, viewpoints, although in some cases individuals outside the organization may need to be

recruited to provide the extent of diversity that is required. In cases where the potential participants cut across many formal organizations and institutions (as in scientific pursuits), bringing these people together in one interactive setting is much more difficult, yet essential if the process is to take place.

Step 2: Designing Groups Around Conclusions

Once the individuals have been assembled and have received whatever instruction on the process that was considered necessary, a small group is formed around each of the existing conclusions. If it is felt, through an open discussion, that additional conclusions should be specified, this can be done. As long as three to five distinct conclusions are stated, then the number of small groups will be useful and manageable.

The groups can be formed by asking individuals to self-select into a "conclusion group" because of their endorsement of the conclusion. Basically, since a true dialectic can take place only when individuals really believe and feel strongly about their position, as much as possible each individual should follow his/her convictions in choosing a group. Ideally, five to seven members would make up each group, but three to ten can be workable. Thus, if there are four conclusions and five persons in each group, twenty individuals would be involved in the process.

It is worth mentioning that there are a number of alternative ways of forming these groups for assumptional analysis, other than self-selection. Groups can be formed by vested interest—the natural breakdown of conclusions in certain situations. Groups can be formed by distinguishing other criteria such as areas of expertise (e.g., scientific discipline, educational background) or even personality types or styles (Kilmann & Mitroff, 1976). Some of these alternative methods for group formation are useful when distinct conclusions are not yet available because the "problem" is so vague. Composing groups by these other criteria is a way of explicating initial conclusions—their differences being derived by fundamental differences in the membership across groups (see Kilmann, 1979, for a further discussion of alternative ways of forming groups).

Step 3: Performing Group-Assumptional Analysis

When the different small groups have been composed, each group goes through the assumptional analysis separately, up to the point of sorting their assumptions onto the assumption matrix. Specifically, each group first develops a list of relevant stakeholders for their particular conclusion, not

concerning themselves at all with what the other groups might be considering. From the stakeholders, each group writes up their assumptions in a form to show maximum support for their initial conclusion, and then sorts these into the cells on Fig. 1, again to maximize the group's ability to argue most strongly for their viewpoints.

It may now be apparent that one of the reasons for this dialectical approach, in contrast to utilizing only one group or individual, is that every group is likely to ignore certain stakeholders and assumptions which do not allow it to provide the strongest support for its case. Actually, each group finds it very convenient to overlook the assumptions that might weaken its case or at least to minimize the effect of "negative assumptions" by sorting these into the less-important regions of the matrix.

Clearly, if only one group were involved in the entire process, the final results would be very biased and misleading. To compensate for the bias of any one group, are the biases of the other groups. These biases can be expected to be different to the extent that each group was composed differently at the start in terms of initial conclusions, general background, and expertise of the members of each group, vested interests, and so on. Therefore, what one group takes as a given (or conveniently chooses to ignore), the other group(s) consider as an unwarranted assumption. Even put more strongly, these very biases for each group, as long as the biases are different (because of group composition) are viewed as an advantage of the dialectical approach (Mason, 1969). These biases are always operating, if only implicitly. To make these biases explicit, especially in an extreme form, not only makes them open for examination but forces a confrontation of biases. Again it might be said that the methodology of confronting multiple biases via the dialectical approach is the one best suited for complex, ill-defined problems.

Step 4: Performing Intergroup-Assumptional Analysis

After each separate group has prepared their assumption matrix, the process moves to an intergroup challenge of the assumptions. The groups all meet in the same room and each group in turn presents their matrix to the others. When every group has made their presentation (allowing only for questions of clarification at this time) each group meets separately to consider with which other groups' assumptions (and stakeholders) they disagree and why. It might be that they disagree with the way a particular group: (1) stated an assumption, (2) failed to mention what is considered an important assumption, or (3) placed an assumption on a different section of the assumption matrix. After each group has prepared such an assessment of the other groups' presentations, all the groups meet in the same room again, this time for the full debate.

Each group is placed on the "hotseat" as the other groups have the opportunity, one by one, to question and challenge the focal group's earlier presentation. Sometimes, concessions are made during this debate as one or more groups realize that they cannot "get away with" certain assumptions that, upon inspection, do not seem very credible. Alternatively, some groups accept that they will need to include certain assumptions in the "more-important" area of the matrix, which they previously chose to ignore. Perhaps one group overlooked an entire set of stakeholders. The other groups then require that the group in question proceed to develop some assumptions for these stakeholders. As alluded to earlier, it is during this kind of debate where the various biases all surface and tend to provide checks and balances for each other. As long as a diverse set of participants was included in the behavioral process and as long as the initial conclusion groups were formed to represent vastly different approaches to the complex problem, it is very unlikely that a major assumption will go unchallenged.

After an active debate has taken place on any or all assumptions, the time has come to list the remaining issues that have not been resolved. These issues represent the differences that one or more groups cannot "live with" or cannot quite accept. Often this list of issues is the absolute *core* of the problem—the most critical assumptions which fall into the most-important/certain and the most-important/uncertain regions of the assumption matrix. However, there may be considerable disagreement as to the wording of these assumptions or whether or not a particular assumption is to be viewed as true or false.

Step 5: Resolving and Synthesizing Assumptions

The next step is to compose a synthesis group of representatives from each of the original conclusion groups. For example, if there were four conclusion groups, two members from each group would be chosen (nominated) for membership in the synthesis group. The objective of this new group is to examine more thoroughly the list of unresolved issues in order to develop a synthesis that all participants can accept. The climate and sanctions, correspondingly, must also shift from one of conflict generation (debating disagreements) to conflict resolution (creating acceptable solutions).

It may not be easy for members in the synthesis group to make this switch. For one thing, there is an inherent tendency for members to be loyal to their earlier group and to try to influence other members in the synthesis group toward these loyalities. It this were done, it is unlikely that a creative synthesis could develop, nor would there be wide acceptance of the final "synthesis." At best, each conclusion group would identify with that part of the synthesis which favored its views, with the other groups being very

dissatisfied with the solution. It is possible, for example, that each of four conclusion groups is only one-quarter satisfied with the synthesis—not a very good resolution of issues. What is essential, therefore, is to motivate the synthesis group to develop collaborative, creative "packages" whereby assumptions are modified to take into account all or most issues that were raised during the debates. This is in contrast to "splitting the differences" or compromising to the extent that one representative gets his views on one issue while another gets his assumptions on another issue.

A behavioral process can be proposed that has worked in the past to solve the problems of group loyalties and weak compromises when these arise in a synthesis group. The "trick" is to form *several* synthesis groups where as before, each group contains representatives from each conclusion group. In the example given earlier, if there are four conclusion groups and say six members in each, then three synthesis groups can be composed by taking a different two members from each of the four conclusion groups. The three new synthesis groups would contain eight members apiece.

At first, this approach of multiple synthesis groups may seem awkward or cumbersome. In actuality, it tends to minimize earlier group loyalities by shifting competition among the conclusion groups to competition among the synthesis groups. Specifically, all synthesis groups are given the instruction: "Let's see which group can come up with the best synthesis—the synthesis which (by vote, perhaps) is deemed most acceptable to all participants in this process." Usually members in the synthesis groups forget or simply leave aside their earlier loyalties since the "rules of the game" have now been changed. Not surprisingly, the various syntheses that emerge from this multigroup process are not all that different. In contrast to the composition of the conclusion groups, the various synthesis groups have a very similar pattern of membership (i.e., every synthesis group is composed of the same representation of the conclusion groups, just different representatives). Each of the synthesis groups uses the same information, perspectives, and expertise, although some differences in the proposed resolutions across groups would stem from different group processes, or instances of insight and synergy.

Step 6: Deriving the Synthesized Conclusion

Whether or not one or more synthesis groups are utilized, the product that emerges from this activity is a *synthesized assumption matrix*. Where the conclusion groups may have differed substantially with regard to proposed assumptions and the sorting of these assumptions onto separate matrices, the synthesis group (s) sought to resolve these differences in a

creative way, making use of all variable knowledge and expertise. The synthesized assumptions matrix now becomes the new foundation for deriving (deducing) the conclusion which would have maximum support from the synthesized set of assumptions. The final step, consequently, is for the synthesis group to prepare the new conclusion after their synthesized assumptions have been accepted by all participants in the process.

In essence, once all relevant and critical assumptions have been made explicit, been challenged and questioned, and then been modified, it is possible to derive in a logical manner the conclusions that seem most warranted, given this set of assumptions. These "givens," however, have not been simply taken for granted but were developed in a most comprehensive manner. Naturally, as things change theses assumptions will need to be monitored, examined, and modified again. But for the moment, at least, the assumptions which support the new conclusions seem reasonable and are acceptable to a diverse group of experts. One assumption behind this methodology is that the latter is a firm basis for having confidence in the validity of a complex conclusion for an ill-defined, dynamic problem.

As a final comment on this behavioral process, prior experience with the methodology suggests that in most cases, the new conclusion that is derived from the synthesized set of assumptions *is* new. It is not, typically, a restatement of one of the earlier, initial conclusions. In other words, when assumptional analysis works it does not focus on choosing among initial conclusions as much as it enables a truly new, integrated, creative conclusion to be stated. Only if the synthesis group members did not let go of their earlier loyalities and proceed to engage in swapping issues and compromises, would the "synthesized" conclusion be a rather simple combination of the initial conclusions or a paraphrasing of just one of them. Otherwise, the synthesized conclusion does seem to portray a very new view of the problem at hand (Mitroff et al., 1979).

APPLYING THE APPROACH TO THE SOCIAL SCIENCES

The formulating and testing of theories in the social sciences, still, and perhaps always, represents a vague, ill-defined problem. Deducing hypotheses from theories and inducing theory from empirical findings, deducing new hypotheses, inducing new theories, and so forth, is the sort of ongoing process by which knowledge develops. One can never be sure if particular research results fully support or reject a theory; such support or rejection must result from an accumulation of research findings and discussion over a long period of time. It would be very convenient, however, if some process could be devised to pinpoint the areas that a

theory or hypothesis should concentrate on as well as to speed up the process of deduction and induction, in general.

While it may seem premature to suggest this, it is felt that the theory and method of assumptional analysis can be utilized efficiently and effectively for this purpose. The process has been described so far in rather general terms for application to any complex conclusion or problem. In the remaining pages of this paper, a brief discussion is offered on how the behavioral process that was outlined can be applied to the complex endeavors of social scientists, particularly "retroduction."

To begin with, any theory can be viewed as a conclusion, no matter how tentative. All that assumptional analysis requires is really some starting point, fully anticipating that the conclusion will be modified during the process. Specifically, one might say that the objective of assumptional analysis is to modify the initial conclusion to reflect a more explicit, thorough, and valid understanding of the relevant assumptions behind the conclusion. Further, the ongoing process of revising theories and hypotheses has a similar if not identical objective in mind, if not always so stated. Hypotheses and their corresponding theories are not likely to be valid if their underlying assumptions are believed to be false and if alternative assumptions seem more plausible and reasonable, given the up-to-date knowledge and experience in a field of study.

In the social sciences there generally are many theories and hypotheses that can explain some observed behavior or rigorous research finding. These become competing explanations, where research and discussion attempt to rule out the alternatives, one by one, until only one or at most a few explanations remain. The experimental research design has as its objective the elimination of alternative explanations for the "treatment" condition and this is why the experimental method has been cited as *the* methodology for the social sciences (Campbell & Stanley, 1963). But elaborate research designs, by themselves, may not get at the great variety of assumptions that social scientists necessarily are making as they formulate and test their competing theories. This is not to say that assumptions are ignored completely, only that the traditional process of research may be somewhat indirect and possibly haphazard with regard to the creation of synthesized theories. *Creating* theories is a much more subjective process than would be inferred from the experimental method.

This paper argues for a behavioral process that very purposefully and directly confronts the underlying assumptions of competing theories and requires social scientists to partake in a direct and extensive effort at synthesis. Assumptional analysis is not meant to replace the scientific method but to supplement it by getting at the heart of what scientific progress is all about. The assumption is that a *behavioral* process is more efficient and effective than merely the impersonal debates that go on in the

pages of journal articles or even at professional meetings of various scientific associations. Both of these are often narrow in that the "debates" take place only within one or two disciplines. In addition, the debates may very well stay at the surface level, as a discussion of theories, rather than at the deeper level of assumptions. Only an explicitly designed process, including the necessary educational inputs to the participants of the process as well as the development of group and intergroup skills, is likely to provide a high-quality debate and synthesis of the assumptions behind the theories (Mitroff & Kilmann, 1978).

A Hypothetical Example

It is easy to be skeptical and believe that no diverse, transdisciplinary community of social scientists (e.g., psychologists, sociologists, political scientists, economists, anthropologists, etc.) would ever engage behaviorally in such a confronting procedure; nor would these individuals be receptive to "educational inputs" and group process skills from another scientist or educator. Notoriously, educators and scientists do not seem willing to learn from others (those in other disciplines) as much as one would expect from the nature of their vocation. If the following experience can never be created, then perhaps the scientific methods that now exist, will remain the same.

Hypothetically, then, consider having gathered together a community of 20-30 diverse social scientists, all of whom have been researching diverse aspects of organizational behavior. A listing might be made of all the paradigms, no matter how tentative, of the prevailing wisdom of these individuals—perhaps in the form of "specific theories." Such a collection of scientists in all probability, could generate at least 30-50 of these theories.

An important step is to reduce this list down to four to eight "clusters" of theories/hypotheses representing fundamentally different ways of explaining organizational behavior. These clusters could look something like the table of contents across the major books in the field, for example: organization design, technology, environment, leadership, motivation, job design, group dynamics, personality factors, or more specifically, this leadership style is most effective in that situation, this organization structure is most effective for adaptiveness in that environment, this process of job design most impacts on performance and satisfaction under these conditions, and so on. In essence, each cluster would contain fairly homogeneous and related concepts, relationships, theories, etc., within the cluster but be very different from the other clusters. The more diverse the community of scientists, the more different will these clusters be. It is possible to use one of several methods to reduce the list of

items into clusters and then to assign scientists to a cluster, or allow for self-selection (Kilmann, 1979).

The clusters of theories/hypotheses along with the several scientists that endorse or support these, become the conclusion groups. Each group goes through the stakeholder analysis and group-assumptional analysis ending with their assumption matrix, as described earlier. The groups then meet to debate their different assumption matrices and eventually develop the list of unresolved issues. The list of issues, it will be recalled, would represent the core foundation of the field of organization behavior, noting the assumptions that fall into the most-important/certain region but especially into the most-important/uncertain region of the matrices, yet there would be much disagreement as to the wording and truth/falsity of these assumptions.

Next, one or more synthesis groups are formed to resolve the list of issues. Depending on the group process and the ability of the scientists to remove at least some or all of their vested interests, the quality of the synthesis is determined. The synthesized conclusion would portray an integrated, hopefully creative stance toward the field of organizational behavior, based on the interactive wisdom of all the scientists who participated in the process. Again, if this were indeed a very diverse and representative group (representing the relevant disciplines, and pet hypotheses in the field), then the synthesized conclusion might provide an important breakthrough in analyzing and then proposing the "state of the art" for the time being.

The synthesis is not a substitute for empirical investigation and the traditional scientific method. Quite the contrary, the synthesis suggests the next set of theories/hypotheses to research—presumably the most important directions to pursue. Furthermore, the synthesized assumptions that were sorted into the most-important/uncertain region need extensive investigation: to move these toward greater certainty so that the field does not rest on such unsure, untested waters. If the synthesis of assumptions were created by the process as intended, it is likely that the assumption investigations will be very important to the further development of the field by ultimately rejecting, modifying or temporarily confirming the synthesized "conclusions." Finally, even the most-important/certain assumptions as well as assumptions that were sorted into the other important regions, should be monitored via research in some way. As society undergoes change, so does the state of assumptions regarding human nature, social environment, and the interactions between the two. It would be wise to keep in mind the dynamic nature of society and its assumptions when any social science field is provided "synthesized theories."

CONCLUSIONS

In the spirit of assumptional analysis, it seems appropriate to summarize some of the assumptions behind the methodology so that its benefits and its shortcomings can be better understood and anticipated. Some of these assumptions, as will be seen, are the very same assumptions that the author would expect to uncover regarding human nature in organizations (or institutions of science) by conducting assumptional analysis for an actual community of scientists, as hypothetically described.

Assumptional analysis, particularly the behavioral process proposed to operationalize the theory, assumes that the participants want their assumptions exposed. This is a most-important yet uncertain assumption since its validity highly depends on a given situation. Exposing assumptions is not only confronting an individual's truths, but can also be a painful experience. It may be shown that the assumptions a person has been living by for years are clearly false, once exposed and subjected to collective wisdom. Individuals may make every effort to protect their "tried and true" assumptions rather than take the chance of exposing them and finding out they have been wrong all these years. It also is easier for a person to argue for his point of view if others are not able to expose and challenge his assumptions. This perspective on human nature leads to another set of assumptions.

Assumptional analysis assumes that people are largely rational; that they can and will make choices that reflect the greater good, the development of valid knowledge, effectiveness and efficiency, and all the other "good" characteristics that social scientists tend to ascribe to human nature. Consider an opposite set of assumptions—that people are largely *a*rational if not *irr*ational; that they make choices to protect themselves and their place in society (as they perceive it), and that they often act on fears, anxieties, fantasies, etc., for all sorts of defensive reasons or as a result of intrapsychic conflicts in general. This latter set of assumptions might be closer to supporting the need for multiple synthesis groups so that participants' vested interests will give way to the rational synthesis of assumptions. Assumptional analysis certainly is presented as a very rational, logical procedure, but it may not work if the assumptions about "rational man" are just not true. This also might help to explain why scientific fields seem, at times, to move so slowly, carefully, and to be so harsh on new, innovative theories and approaches (Armstrong, 1980). Perhaps scientists are as human as anyone else and are simply acting out the nonrational set of assumptions (Mitroff, 1980).

A final set of assumptions to consider for both assumptional analysis and the field of organizational behavior, concerns the implicit influence process that takes place among individuals. Assumptional analysis attempts

to be nonpolitical, at least on the surface, by setting up *equal* conclusion groups, without weighting one more than the other in the final synthesis. The assumption being that a democratic process with equal influence (e.g., one vote per member or group) will result in a "better" synthesis than a politicized process where participants and groups are freer to gain and use unequal power and influence. If it is assumed that social environments are networks of coalitions attempting to enlarge their domain of influence over others and the general environment, then assumptional analysis may be trying to establish a social environment that is both foreign and unacceptable to the participants. One reason, therefore, that the methodology will not work in many or most settings is that it prevents the "community" from engaging in its natural political processes. Even if the synthesized conclusion were high in creativity and quality, it might not be accepted because the process is unacceptable, regardless of the outcome (something akin to, "the medium is the message"). This assumption on political behavior could be just as germane to behavior in organizations and may explain why so many efforts at organizational change have failed (Huse, 1980).

Exposing, examining, and empirically testing these assumptions of human nature and social environments are expected to be critical for the further development of organizational behavior, just as for scientific methodology. What would be most ironic, however, is whether the assumptions behind approaches like assumptional analysis turn out to be false (as contemplated above), and therefore will serve to prevent these approaches from contributing to organizations and science. Whether or not this is as it should be, depends on the assumptions one is willing to make.

BIOGRAPHICAL NOTE

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REFERENCES

ARMSTRONG, J. S. Advocacy as a scientific strategy: The Mitroff myth. *Academy of Management Review,* 1980, *5*, 509-511.

CAMPBELL, D. T., & STANLEY, J. C. *Experimental and quasi-experimental designs for research.* Chicago: Rand McNally, 1963.

CHURCHMAN, C. W. *The design of inquiring systems.* New York: Basic Books, 1971.

GALBRAITH, J. *Designing complex organizations.* Reading, Mass.: Addison-Wesley, 1973.

GILBRETH, F. B. *Primer of scientific management.* New York: Van Nostrand, 1914.

HUSE, E. H. *Organization change and development* (2nd ed.). St. Paul, Minn.: West, 1980.
KATZ, D., & KAHN, R. L. Some recent findings in human relations research in industry. In G. W. Swanson, T. M. Newcomb, & E. E. Hartley (eds.), *Reading in social psychology* (2nd ed.). New York: Holt, 1952.
KILMANN, R. H. Problem management: A behavioral science approach. In G. Zaltman (Ed.), *Management principles for nonprofit agencies and organizations.* New York: AMACOM, 1979.
KILMANN, R. H., & MITROFF, I. I. Qualitative versus quantitative analysis for management science: Different forms for different psychological types. *Interfaces,* 1976, *6*(2), 17-28.
MARCH, J. G. & SIMON, H. A. *Organizations.* New York: Wiley, 1958.
MASON, R. O. A dialectical approach to strategic planning. *Management Science,* 1969, *15,* B403-413.
MASON, R. O., & MITROEF, I. I. A program for research on management information systems. *Management Science,* 1973, *19*, 475-487.
MITROFF, I. I. *The subject side of science: A philosophical inquiry into the psychology of apollo moon scientists.* Amsterdam: Elsevier, 1974.
MITROFF, I. I. Reality as a scientific strategy: Revising our concepts of science. *Academy of Management Review,* 1980, *5*, 513-515.
MITROFF, I. I., & EMSHOFF. J. On strategic assumption-making: A dialectical approach to policy and planning. *Academy of Management Review,* 1979, *4*, 1-12.
MITROFF, I. I., EMSHOFF, J., & KILMANN, R. H. Assumptional analysis: A methodology for strategic problem solving. *Management Science,* 1979, *25*, 583-593.
MITROFF, I. I., & KILMANN, R. H. *Methodological approaches to social science: Integrating divergent concepts and theories.* San Francisco: Jossey-Bass, 1978.
ROETHLISBERGER, F. J., & DICKSON, J. *Management and the worker,* Boston: Harvard University, 1938.
SAATY, T. L. *The analytic hierarchy process: Planning, priority setting, resource allocation.* New York: McGraw-Hill, 1980.
SHAW, M. E. *Group dynamics,* New York: McGraw-Hill, 1971.
TAYLOR, F. W. *Scientific management,* New York: Harper, 1911.
THOMPSON J. D. *Organizations in action,* New York: McGraw-Hill, 1967.
TRIST, E. L., & BAMFORTH, K. W. Some social and psychological consequences of the long-wall method of coal-getting. *Human Relations,* 1951, *4*, 3-38.
WEBER, M. *The theory of social and economic organization A. M. Handerson and Talcott* Parsons. (Trans.). New York: Free Press, 1947.
WEICK, K. E. *Social psychology of organizing,* Reading, Mass.: Addison-Wesley, 1969.