Chapter 3

# Societal Systems

## PLANNING, POLICY AND COMPLEXITY

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lying it is relatively foreign to most of the disciplines that could use it as a conceptual foundation for structuring.

The mathematics that appear most relevant to structural modeling are set theory, mathematical logic, combinatorial analysis (e.g., counting), graph theory, matrix theory, and modern algebra, including lattice theory. Although some of these branches are very highly developed, the relevant parts for structural modeling do not require access to the pinnacles of theory but rather involve mainly the fundamentals.

An interesting characteristic of these parts of mathematics is that they correspond rather closely to how people appear to behave intuitively. For example, people tend to cluster things in sets and often apply logic even without the benefit of any formal training in it. People also appear to have a mental capacity to do some of the things intuitively that structural modeling helps them to do explicitly and with greater scope. Experience indicates that the desire of people to learn structural modeling peaks when they encounter problems beyond their threshold of intuitive performance.

The full potential of modeling can be achieved only by taking maximum advantage of all the representation systems open to human exploitation. This means also that it must be made possible to convert from one representation system to another with ease. Two principles apply. First, there is the *principle of association*, which states that the developer of a model must engage in associating elements of representation systems with those things that are to be modeled. Second, there is the *principle of model exchange*, which states that it is desirable to find ways of transforming a model from one representation system to another to meet the needs of understanding, learning, and effective communication.

When modeling deals with a set of ideas, in particular when the idea actions are involved, it is necessary to develop a level of specificity for the associations and transformations that will permit the foregoing principles to be actualized.

## The Separation Conjecture

Modeling may often be done by groups of individuals, contributing their own special knowledge to the development of a model. But human behavior in groups often involves a random mixing and overlapping of idea actions. Such random mixing does not lend itself to methodology that seeks to strengthen, sharpen, and facilitate each individual idea action. Instead the burden of attaining productivity tends to fall heavily on group leadership. This often creates an unmanageable situation which frustrates productivity. The *separation conjecture* speaks to this situation as follows:

Excerpt FROM CHAPTER 2 ← (Background for Chapter 3)



**GREATER INTELLECTUAL PRODUCTIVITY CAN BE ACHIEVED BY BOTH GROUPS AND INDIVIDUALS THROUGH CONSCIOUS SEPARATION OF MENTAL ACTIVITY INTO DISTINCT IDEA ACTIONS, EACH BEING CARRIED OUT WITH METHODOLOGY ESPECIALLY APPROPRIATE TO IT.**

Separation facilitates the development of associations and transformations needed for model development and application.

Much of what follows in this book is predicated on the validity of the separation conjecture. Also, much of what follows is aimed at demonstrating how to apply this conjecture in real situations to the development of effective models for understanding, learning, and communicating about complex issues.

## Idea Generation

Idea generation is one of the fundamental idea actions. This involves the incompletely understood process whereby an individual produces an idea. For completeness it is supposed that this idea finds its way into written form. Also in deference to the societal systems theme of this book, it is supposed that the idea is generated in a problem-oriented situation, aiming to be relevant to that problem.

Idea generation is sometimes associated with the special use of the so-called "creative methods," those methods or techniques designed to evoke creative output. While creativity is a valuable human asset, it is not always necessary to stipulate its presence. Instead a lesser goal of productivity may be sought. It is not always true that a basically new idea is needed to solve a problem. Very often what is needed is simply an integration of ideas that are accessible. Creativity has been defined as "the imaginatively gifted recombination of known elements into something new." By this definition, it is not clear where creativity begins and productivity ends. In one sense, productivity encompasses creativity, without being necessarily restricted to it.

It is desired to embrace both creativity and productivity in idea generation, without being constrained to distinguish the former from the latter. Hence it is appropriate to consider what is available from the literature of creativity, without being bound to it.

### *Enhancing Creativity*

According to Lowenfeld [18], the characteristics required for creativity are "flexibility, fluency, sensitivity to problems, originality, and the ability to analyze, synthesize, and redefine materials and problems and organize

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# 3

# The Organized Conduct of Inquiry

In discussing the organized conduct of inquiry into complex issues, it would be as much an oversight to overlook the possibilities for isolated individual contributions as to avoid the question of how groups can be effective. Therefore, what is needed in initiating a discussion of the organized conduct of inquiry is a focusing concept that is sufficiently broad to allow for the benefits of integrating the work of groups with the work of individuals acting alone. This concept is the task-oriented, transient organization or "TOTO" (pronounced toe-toe). The task orientation arises out of some context that is sufficiently complex that individual effort is insufficiently broad, while group effort is insufficiently deep. The task then becomes the rationale for building an organization. But such an organization is considered to be transient, coming into existence for a time, with perhaps changing makeup during that time as the issue becomes better clarified, and dissolving after its contribution has been made.

The study of such organizations has been very limited, particularly when contrasted with the study of such organizations as corporations, which are usually perceived as self-perpetuating. The survival motivation for organizations intended to be permanent has a major impact on the theory and operation of these organizations. The TOTO, by contrast, wishes to dissolve but does not expect to do so until its task is completed.

## TOTOS

It is possible to increase substantially both the intellectual productivity of people and their satisfaction with the results of their efforts, through better management of ideas in TOTOS.

TOTOS often function through group activity, but they are *more than groups*. Group activity is interspersed with isolated individual effort. Moreover cognitive aids may be vital parts of their functioning. Research done

on groups may be relevant to the understanding of TOTOS, but cannot be the sole ingredient of such understanding.

Because TOTOS are organizations, some of the theory of permanent organizations, including ideas on management, can be applied to them, but some of it cannot.

Because a TOTO may have a short period in which to accomplish its task, creative behavior may often be very valuable; hence results of research on creativity may be relevant to TOTOS, but cannot be the sole ingredient of such understanding. Intellectual productivity may be a more important concern than creativity.

Because TOTOS require leadership, some of the principles of leadership that have evolved from psychology may be relevant to understanding them. But these leadership principles have been applied in situations where the substantive tasks are often not as complex as those involved in societal problems and have been somewhat more oriented toward a good experience of participation than to productive task results, both being desirable.

Thus there is a need to aggregate various relevant research results concerning groups, organizations, creative and productive behavior, leadership, and individual effort to build a rationale for improving intellectual productivity of people, along with some practical means for achieving this increased productivity, in the context of the TOTO.

In the ensuing development several conjectures and principles are stated. The principles are capsule summaries of results of research or thought from various fields. The conjectures, while related to the principles, are less well supported by published research than the principles.

While all the principles and conjectures seem relevant to the study and understanding of TOTOS, the "separation conjecture" given in Chapter 2 is viewed as a principal basis for the design of TOTOS. This conjecture reflects the conclusion that conventional group processes are often ineffective, and the more radical conclusion that one of the best ways to achieve substantially greater productivity in TOTOS is to identify a set of basic idea actions that constitute mental activities, then to apply methodologies tailored to making each kind of idea action productive in its own right. In support of the separation conjecture, two methodologies are specifically recommended to accomplish particular idea actions.

## Participation in Group Discussion

It is a tenet of group research that the individual is free to choose whether to become a member of a group. This tenet is clearly violated on many occasions, as organizational requirements often determine group membership for practical purposes. In any event, the individual is certainly not free to choose whether to participate verbally in a group discussion, as the following principle adapted from Stephan and Mishler [1] indicates:



**Principle 1. Unequal Verbal Participation.** In meetings where the members have no sharply delineated roles, and there is no systematic regulation of free competitive expression, verbal participation tends to follow an exponential law.

Two bar graphs are presented to illustrate this principle. Each represents, by the height of the bars, the approximate time that different members would have the floor during one hour of group discussion. Figure 3.1 shows the time distribution for a group consisting of 1 leader and 4 other members. Figure 3.2 shows the time distribution when there is 1 leader and 12 other members. It is seen that in a group with 12 members, half of them will make virtually no verbal contribution. Specialists in group leadership who act as professional moderators or facilitators, may be well aware of the implications of principle 1, and may reduce the time given over to leadership in a variety of ways, while intervening to modify the dynamics. But when the number of members gets large, say 12, if every-

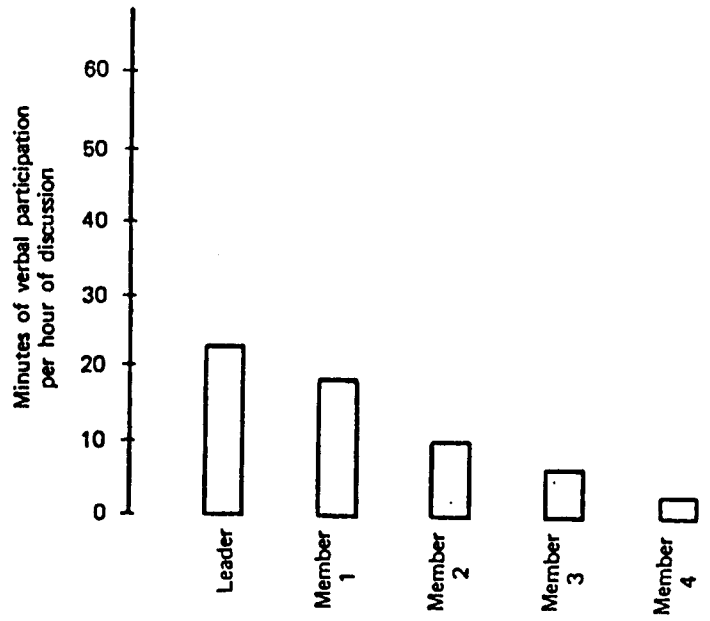


Figure 3.1. Relative verbal participation for four members and leader.

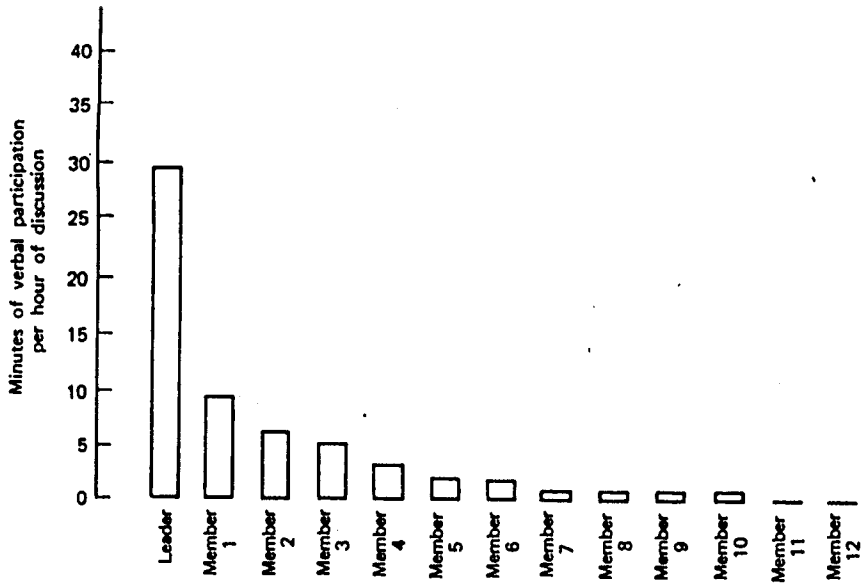


**Figure 3.2.** Relative verbal participation for 12 members and leader.

one enjoys equal verbal participation, everyone fails to contribute in a direct sense over 90 percent of the time, and there is nothing any leader can do to change this arithmetic. The members, in such a situation, had better be anxious to learn by listening, otherwise most of them will probably experience some frustration. Out of such considerations comes a conjecture, well-established in the folklore of groups, and frequently disregarded:

**Conjecture 1. Group Size.** The size of a group should never exceed eight persons, except when it is understood that the principal role to be played by most members most of the time is that of listener.

Whereas listening may be very valuable, at least two negatives attach to it. Most people are not very good at it. Also no opportunity for positive contribution appears if the role is limited to that of listener. The organization may be dissolved by the time the potential contributor has a chance to put forward his ideas. This suggests the merit of the following conjecture:

**Conjecture 2. Parallel Participation.** In much conversational group activity, only one person is speaking at a time; but if conversation is eliminated it is feasible to have all participants contributing effectively at the same time in a parallel mode through written expression. Moreover, each



participant can thereby be given an opportunity to read what others are contributing in the process. As a result, productivity increases significantly.

The validity of this conjecture has been tested in a number of situations. The brainwriting pool, discussed in Chapter 2, can provide a parallel mode in place of the serial mode of participation so common in discussion groups. Whether such participation can be effective in many or most situations is the principal conjectural aspect. Indications are that if the principal goal is idea generating, the brainwriting pool will generally increase productivity considerably. In a few instances, it has not been very effective, and these few instances have been characterized by hostility to the process from the outset and inexperienced leadership.

## The Equivocal Nature of Relevant Research

Before proceeding further, it is appropriate to discuss the equivocal nature of some of the relevant research. It is often explicitly stated by researchers that the results of a given experiment are not necessarily generalizable to some other context. Even where generalization is possible, exceptions may also be found. Particularly in the behavioral area, it is sometimes thought to be dangerous to apply research ideas on the grounds that they might be misused with bad consequences. All of these cautionary ideas are well-founded, even laudable. Nonetheless, the following conjecture is warranted:

**Conjecture 3. Restrictive Conservatism.** Since many results from research in the social and behavioral sciences are equivocal, conservatism in their application in everyday life may be so great as to inhibit progress; likewise conservatism in publishing research results may be reflected in failure to emphasize potential principles suggested by the results that hold some opportunity for application.

It may be that the *user* of social science should be responsible for formulating tentative principles based on social science research which the user believes to be at least worth testing in everyday life.

All the principles and conjectures concerning the design and operation of TOTOS can be viewed as equivocal. Nonetheless, there is considerable benefit to taking them as a collective set of hypotheses suitable for TOTO design. In the Törnebohm sense (Chapter 2), they lie at one of the theoretical levels, and having been aggregated to form a concept at a higher level, can be put into action at that level with due concern for their continuing evaluation in practice. This amounts to seeking simplicity and distrusting it.

### Mead's Expectation Principle

When a group is to congregate for some purpose, there is always a question of what kind of advance information concerning the purposes of the meeting should be provided. This question can be considered from the point of view of what would be most desirable in the eyes of the participant, as well as what would be desirable from the point of view of promoting productivity. The participant viewpoint is embedded in Mead's Expectation Principle [2], stated as follows:

**Principle 2. Mead's Expectation Principle.** "It is better if all future participants have as uniform pre-conference expectations as possible. Participants should be given as clear a picture as possible of all the arrangements which have been fixed in advance."

The significance of this principle to the TOTO is that it recognizes that TOTOS are more than groups, and that individuals acting separately can often accomplish things which conversational groups could not do effectively. When participants understand clearly what is anticipated, they have time to collect ideas that may be useful to the group. Also individuals have a greater feeling of security by knowing beforehand what to expect and can conceivably be more productive in the group as a consequence.

Very often, if this principle is to be applied productively, it is necessary to plan the meeting carefully; otherwise it may not be possible to sustain the expectations. Changes of direction during meetings may be viewed with suspicion by participants, and some may elect simply not to be effective.

### Natural Group Developmental Sequence

It has become reasonably clear, from many studies of groups in action, that there is a natural developmental sequence that groups pass through (though not, in general, as sharply as the following discussion may suggest). This natural sequence should be understood for several reasons. First, if designs are to be drawn for TOTOS that interrupt or alter this sequence, such designs must relate in some way to it. Second, the strengths and weaknesses of the natural sequence should be appraised. Third, evaluations or comparisons of alternative sequences can be made.

The natural developmental sequence is embodied in this principle, which is adapted from Tuckman [3]:

**Principle 3. Natural Development of Groups.** Small groups tend to follow a natural developmental sequence, characterized by four stages: forming, storming, norming, and performing. *Forming* involves orientation, testing to identify the boundaries of interpersonal and task behavior, and establishment of dependency relationships with participants or preexisting standards. *Storming* involves conflict and polarization around interpersonal issues, with concomitant emotional responding in the task area. *Norming* involves ingroup feeling, cohesiveness, new standards, and adoption of new roles. *Performing* occurs when interpersonal structure becomes the tool of task activities. Roles become flexible and functional, and group energy is channeled into the task. Structural issues have been resolved and structure is supportive of task performance.



This principle is of particular interest when the task is a very complex one, for example, deciding what to do nationally about inflation. It seems almost painfully evident that the time required for forming, storming, and norming will be long when the task is complex. Then the following conjectures seem relevant:

**Conjecture 4. Leadership and Complex Tasks.** Conventional ideas of group leadership are most highly attuned to relatively simple tasks for groups, wherein the substantive topic is fairly well understood by the leader. These ideas are least well attuned to complex tasks where no one in the group has a thorough understanding of the task area.

**Conjecture 5. Sponsor Impatience.** When a task is quite complex, the stages of forming, storming, and norming may take quite a long time. Financial supporters of the group may easily become impatient with what appears to be lack of progress on the task long before the group reaches the performing stage. Support may therefore be withdrawn prematurely, and no useful product emerges.

**Conjecture 6. Group Impatience.** When a task is quite complex, the stages of forming, storming, and norming may take quite a long time. The group itself may easily become impatient with apparent lack of progress on the task, and its members may behave in such a way as to destroy the group before it ever reaches the performing stage. As a result, no useful product emerges.

In view of these conjectures, it seems quite appropriate to reinforce some of the earlier remarks about the utility of cognitive aids with a more specific statement:

**Conjecture 7. Speedup Through Cognitive Aids.** The uncertain and possibly prolonged duration of storming and norming stages of group effort are particularly susceptible to substantial shortening in time, through the use of cognitive aids that assist the group to structure the task area. Such

aids may help the group reach the performing stage much sooner, thereby dissolving the negative impact suggested by conjectures 5 and 6.

## Inherent Limits to Mental Activity

The human has limits on what can be done with the mind, acting as a bare instrument for dealing with ideas. A very important principle, adapted from Miller [4] and reinforced by Simon [5] is the following:

**Principle 4. Bounded Rationalty.** The span of absolute judgment and the span of immediate memory of humans is in the vicinity of seven items. This imposes severe limitations on the amount of information that people are able to receive, process, and remember. By organizing the stimulus input simultaneously into several dimensions and successively into a sequence of chunks, it is possible to break (or at least stretch considerably) this informational bottleneck.

This principle is very supportive to conjecture 7, speedup through cognitive aids. While it is irrelevant, in a sense, to idea generation, it is highly relevant to structuring ideas. Thus a method that was highly useful for generating ideas might be of little use for structuring ideas. The separation conjecture is, therefore, also supported by principle 4.

There is a strong implication that structuring should be a group endeavor, drawing upon the collective ideas of individuals, as a means of helping to overcome individual cognitive limitations. Also it is suggested that structuring should be done by a rather lengthy series of simple steps to ensure as much as possible the validity of the information developed. And it suggests that structuring should be iterative.

In view of bounded rationality, the following conjecture seems reasonable:

**Conjecture 8. Premature Structuring.** Because of bounded rationality, people are conditioned by experience to avoid seeking out an expanded set of relevant ideas; instead they structure prematurely, often on sets that are too limited.

Cognitive aids to structuring may not only help generate better structures but may also encourage the maximum generation of ideas, in anticipation that cognitive aids can be employed to cope with the larger amounts of information. Then structuring can be better in two ways—more information can be incorporated, and there can be more thought given to the development of structure.



Conjecture 8 is supported by the following principle:

**Principle 5. Avoidance of Complexity.** People find it considerably easier to evaluate several attributes of one object than to evaluate one attribute of several objects. As a result a member of a group will tend to focus on an object of personal interest, rather than attempt to work across a set of objects. Even if one or more members attempt to work across a set, their efforts are likely to be frustrated by others who destroy the continuity of an attempt.

The foregoing principle is adapted from Yntema and Mueser [6]. It furnishes one of the reasons groups generate many ideas but do very poorly at structuring them under conventional conditions.

Even when a product is generated by a group acting without cognitive aids, and subject to the normal developmental sequence, the product may not be used, as the following conjecture points out:

**Conjecture 9. Abrogation of Results of Collective Effort.** Confusion concerning the results of collective effort, caused in part from the poor communication of what goes on in a group during the normal developmental sequence, suggests a high probability that whatever results are developed in the task area will be abrogated by later action. This may not only modify the group's results, but may devastate group morale and induce hostility toward those who make such unilateral changes.

A further obstacle to effective group endeavor in the natural group developmental sequence is suggested by the following principle adapted from Dewey and Bentley [7]:

**Principle 6. The Imperatives of Inquiry.** Inquiry has its own imperatives, stemming from the interrelationships of knowledge as well as the specific task characteristics. These imperatives may go unrecognized or be subordinated to the imperatives of group development, thereby precluding necessary activities that require special modes of effort.

The theme or issue under consideration tends to dictate certain approaches to its own resolution. If the theme is well-researched, for example, it may lend itself better to individual exploration than to group discussion. If it is strongly value-sensitive, individual exploration may be too narrow. If the issue is quite unstructured, a mode of operation that facilitates structuring may be necessary. If the issue points toward a decision, but no effective options are apparent, highly creative results may be forthcoming only if unusual procedures are employed.

## Why People Join TOTOS

While groups may be necessary or desirable as task contributors in TOTOS, groups are collections of individuals. The following principle, relevant to the individual, is adapted from Cattell [1]:

**Principle 7. Self-Serving Through Participation.** Groups are devised for achieving individual satisfaction, and their continuance depends on whether they provide a means to the ends of individual goals, through participation.

This principle embodies a strong personal imperative. Every member of a group makes a decision whether to be involved with the group. March and Simon [8] emphasize the importance of this recurring decision. They also stress two other related decisions made individually. One of these is whether to be productive in line with goals of the meeting. Another is to decide whether to use the group to attain personal goals in a way that is neither consistent with or contributory to group goals.

Accordingly, it is most important to group productivity that each individual work out in some way a personal relationship to group goals which permit participation and contribution. Unless group goals are established at a rate compatible with this individual adjustment and adaptation, full productivity is not to be expected, and may well be negated through the use of the group to achieve personal goals unrelated to the task area.

## Demands on Group Leadership

In working with complex issues, there is always a strong need to bring the collective knowledge of specialists to bear on the problem in an integrated way. The synergistic effects possible when specialists interact—that is, learning from and responding to each other—can be extremely powerful in progressing toward resolutions. However, it is also possible that groups will not achieve, and it is important to learn more about how to make groups effective.

Maier [9] has studied group problem solving in an effort to identify the opposing factors at work in such efforts. Table 3.1 shows the summary of group assets and liabilities developed by Maier. Of the four major assets, the first two have to do with bringing greater force to bear on developing a solution to the problem. The last two deal with factors related to implementing the solution that is developed. The liabilities reveal some of the human forces at work that tend to defeat group effort. Assuming that awareness of the liabilities can be effective in finding ways to overcome them, perhaps such awareness will help swing the balance toward a positive outcome.



**Table 3.1** *Assets and Liabilities in Group Problem Solving*

| Group Assets | Group Liabilities |
|---|---|
| 1. Greater sum total of knowledge and information | 1. Social pressure for conformity |
| 2. Greater number of approaches to a problem | 2. Consensus may come too soon and shut out higher quality solutions |
| 3. Participation in problem solving increases acceptance | 3. A dominant individual may exercise undue sway |
| 4. Better comprehension of the decision | 4. Goal of solution to problem may be replaced by secondary goal of winning an argument |

Adapted, with permission, from Norman R. F. Maier, "Assets and Liabilities in Group Problem Solving: The Need for an Integrative Function", Vol. 74, No. 4, Psychological Review, July, 1967.

Maier sees the discussion leader as a critical factor in the success or failure of a group. Table 3.2 contains concepts developed by Maier related to the importance of "the discussion leader" in group problem solving.

The model of the action contains two elements, the group and the discussion leader. With such a model, the burden of integration of activity, seen as essential by Maier, falls heavily on the leader. While this burden may be tolerable when the substantive issue being discussed is relatively clear-cut, it may well become intolerable when the issue is quite complex. In such a situation, the issue complexity may simply accentuate group liabilities, as its members become frustrated with the difficulty of the topic and the ineffective performance of the group. This suggests the following conjecture:

**Conjecture 10. Overload Avoidance.** The leader of a group should not be conceptually overloaded. The necessary integrative functions can be shared with intellectual technology, leaving the leader in a position to spend more energy on group maintenance.

One of the reasons for overload of leadership is the difficulty associated with group decision making.

**Table 3.2** *Factors That May Be Either Assets or Liabilities, Depending on Skill of Discussion Leader*

1. Disagreements
   --May be seen as creating hard feelings
   --May be seen as essential to innovative solution

2. Conflicting interests
   --People may not be solving the same problem
   --Leader may separate and resolve separate interests which often leads to a better solution

3. Risk taking
   --Groups may be more willing than individuals to reach decisions involving risks
   --Risks may be good or bad

4. Time required
   --More time required for a group to reach a decision
   --Long meetings may lead to fatigue-resolution rather than genuine solution

5. Someone must change opinion
   --Who changes can be an asset or a liability

Adapted, with permission, from Norman R. F. Maier, "Assets and Liabilities in Group Problem Solving: The Need for an Integrative Function", Vol. 74, No. 4, Psychological Review, July, 1967.

## Group Decision Making

When complex issues are involved, groups have to make a great many decisions in order to progress. The following principle, adapted from Black [10], is of considerable significance in relation to group decision making:

**Principle 8. Two-Alternative Voting.** The "will of the majority" can readily be determined when the vote poses only two alternatives. But when the number of alternatives exceeds two, the outcome of voting may be sensitive not only to the particular type of voting used, but also to the sequence in which choices are posed.

This principle means that even if voting methods are used to determine group recommendations, the group may not be satisfied because of side effects of the voting techniques which, themselves, threaten both the integrity and the validity of what is done. And it means further that the most effective way of valid assessement of group ideas involves the careful structuring of ideas into simple pairs of alternatives. The likelihood that such can be accomplished spontaneously in an organization with a relatively short life and a complex task to consider is very small, particularly if a normal developmental sequence is permitted to go on without adequate cognitive assistance to the group. Hence it is natural to make the following conjecture:



**Conjecture 11. Group Decision Making.** Groups without substantial cognitive assistance will generally be ineffectual in decision making, except in very simple choice situations. When the decisions are highly structured, and reduced to a set of logical choices between pairs of alternatives, groups can make choices effectively.

## Sequential, Modular Design of TOTOS

From all of the foregoing, the conclusion seems inescapable that the natural group developmental sequence is intolerable when complex task areas are involved. In its place, it is recommended that the separation conjecture become the basis for sequential, modular design of TOTOS. The application of this conjecture to all group situations is not recommended, because some do not require such measures and certain member needs are not satisfied through such an approach. However, there is considerable empirical evidence that application of this conjecture will be very beneficial in a wide variety of group efforts, particularly those requiring high intellectual productivity.

Still, in TOTO design, the importance of individual effort not connected with groups must be kept in mind. When a task is appropriate for group endeavor, it does not follow that the task should necessarily be done entirely by the group acting together. The following relevant principle is adapted from Allport [1]:

**Principle 9. Tradeoff Between Quality and Quantity.** Social influence improves the quantity but not the quality of mental performance. More ideas come from a group than from isolated individuals. Superior ideas are of greater frequency in solitary work than in group work. Hence there is a tradeoff between conversational and expansive idea expression in a group, and greater intensity of logic in isolated effort.

In the sequential, modular design of TOTOS, task efforts should be partitioned into those best carried out by groups and those best carried out by isolated individuals. Since group and individual activities will usually be interdependent, a design that is sequential is called for. In such a de-

sign, there would be a mixture of modular activities, with a sequence that takes into account their interdependencies.

To what extent can such a design be independent of the specific group of people involved? To what extent can it be independent of the particular theme or issue being considered? What is needed is a set of design principles that are relatively *independent* of particular groups or themes, and therefore lend themselves to applicability in a wide variety of task efforts.

These unifying design principles can be based on the concept of idea actions. These actions are taken by all kinds of people in all forms of mental endeavor, and therefore furnish the necessary independence required for construction of generally usable designs.

### *Example Design*

A fictional sequence, drawing on real experiences with real TOTOS, shows an example of a sequential, modular design of a TOTO and its evolution through time.

In presenting this sequence, the psychosocial aspects of group leadership are not emphasized. However, the foregoing material in this chapter is directly related to the leadership role, and the sequence is designed to encompass as many aspects related to behavior as can be accommodated in an outline design. In this sense, the following sequence is visualized as a vehicle for accommodating the logistical requirements associated with organizing group knowledge to a variety of effective leadership styles.

**Step 1. Setting the Primary Goal.** One individual establishes a primary goal for a nonexistent TOTO and communicates this primary goal to potential participants. They agree that it would be useful to have a TOTO for developing plans to achieve this goal.

**Step 2. Generating Relevant Ideas.** At least two means can be considered for generating relevant ideas. One is to collect a group to engage in a brainwriting pool exercise related to the major goal. If it is not possible to collect such a group, each potential member can be asked to write a thought paper giving a variety of views on the topic, with only very general suggestions about content. The papers are received by the TOTO leader.

In either instance, an analyst can extract from the written output the essential ideas in capsule form. These ideas can be structured by the group, with cognitive assistance from a computer and associated displays, as a way of accomplishing several things at once: communicating to the group the core ideas of each of its members, learning as a group some interrelations among the ideas, structuring the ideas.



**Step 3. Structuring the Idea Set.** The group comes together and, when rather minimal individual interaction has taken place, the group begins to structure the ideas, with the aid of the technology.

**Step 4. Interpreting the Structure.** The group examines the structure produced by the group using ideas originating in the group, and its shallowness becomes apparent. The group perceives that it must deepen the ideas in order to make them more significant, but deepening can be done only to a limited extent in the group setting.

**Step 5. Deepening the Ideas.** Individuals undertake separate assignments to deepen particular ideas. As this is done, the early materials seem inadequate, not sharp enough, and not properly interrelated.

**Step 6. Preparing for the Second Group Activity.** The analyst now obtains from the new and deeper ideas generated by individuals a new set of core ideas (some of which will be the same as those generated earlier), along with in-depth clarifications of those ideas.

**Step 7. Restructuring the Deeper Idea Set.** Now the group is ready to restructure the ideas, using the deeper idea set, with suitable cognitive assistance.

**Step 8. Interpreting the New Structure.** Now the group interprets the new structure and amends it to the extent necessary. The analyst may prepare a prose description to accompany the structure and provide documentation to the group effort.

**Step 9. Generating Action Alternatives.** Now the group may conduct a brain-writing pool exercise to generate a set of ideas for action based on the learning that took place in developing and interpreting the structure.

**Step 10. Converting Action Alternatives to Task Form.** Now the action alternatives can be sorted and grouped by an analyst, and potential assignments to specific actors are made.

**Step 11. Structuring the Action Alternatives According to Group Preference.** Again, using cognitive assistance, the action alternatives are structured according to group preference.

**Step 12. Documentation.** The analyst documents for the group the process and results to date.

**Step 13. Putting the Plans into Action.** The plan having been prepared, the work of the original TOTO is ended. Now a new follow-up TOTO must be designed to carry out the plans. This TOTO may be comprised of some or all of the members of the old one, or a new one may be established with a new major goal.

## Group Methodology for TOTOS

TOTOS need assistance in working with complex issues. It has been argued that considerably greater productivity can be obtained from groups by the use of methodology based on the separation conjecture.

In summarizing the methodological recommendations, two principal idea actions are directly involved. These are idea generating and idea structuring. The first of these lends itself to the application of the brainwriting pool method. The second lends itself to organizing these ideas with machine assistance. Both of these methodologies stimulate effective communication. The structuring methodology has the further advantage that decisions are broken into binary choices which are decidable by majority vote, following appropriate focused discussion.

Communication is often described as the culprit in ineffective group activity, when the lack of capacity to structure and the lack of effective voting methods, along with overload of group leadership, are much more likely to be the root causes of the difficulties.

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