AD-A081 600 NAVAL POSTGRADUATE SCHOOL MONTEREY CA F/G 9/2
A COMPUTER SIMULATION OF ORGANIZATIONAL DECISION-MAKING.(U)
DEC 79 V J ANDREWS

UNCLASSIFIED NL

1 OF 1
AD
A081600

END
DATE
FILMED
4-80
DDC

LEVEL II (2)

NAVAL POSTGRADUATE SCHOOL

Monterey, California

AD A081600

DTIC ELECTE MAR 1 1980 S D A

THESIS

A COMPUTER SIMULATION OF
ORGANIZATIONAL DECISION-MAKING

by

Vincent John Andrews

December 1979

Thesis Advisor: C.K. Eoyang

Approved for public release; distribution unlimited.

80 3 10 058

REPORT DOCUMENTATION PAGE

READ INSTRUCTIONS BEFORE COMPLETING FORM

1. REPORT NUMBER

2. GOVT ACCESSION NO.

3. RECIPIENT'S CATALOG NUMBER

9

4. TITLE (and Subtitle)

6

A Computer Simulation of Organizational Decision-Making,

5. TYPE OF REPORT & PERIOD COVERED

Master's Thesis, December 1979

6. PERFORMING ORG. REPORT NUMBER

7. AUTHOR(s)

10

Vincent John Andrews

8. CONTRACT OR GRANT NUMBER(s)

9. PERFORMING ORGANIZATION NAME AND ADDRESS

Naval Postgraduate School
Monterey, California 93940

10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS

11. CONTROLLING OFFICE NAME AND ADDRESS

Naval Postgraduate School
Monterey, California 93940

11

12. REPORT DATE

December 1979

13. NUMBER OF PAGES

84

14. MONITORING AGENCY NAME & ADDRESS (if different from Controlling Office)

12 85

15. SECURITY CLASS. (of this report)

Unclassified

15a. DECLASSIFICATION/DOWNGRADING SCHEDULE

16. DISTRIBUTION STATEMENT (of this Report)

Approved for public release; distribution unlimited.

17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)

18. SUPPLEMENTARY NOTES

19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

Complete Cycle of Choice
Decision-Making Simulation
Organizational Choice
Organizational Learning

251450 Gm

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

A computer simulation of organizational decision-making is developed based on the Complete Cycle of Choice. The interrelationships between attitudes, individual behaviors, organizational choices, and the environment are represented in terms of matrices and mathematical equations. Statistical analysis of the data generated by the simulation

(20. ABSTRACT Continued)

program is performed to discern significant variables and decision-making patterns. Refinements to the basic model are proposed to increase its usefulness as a managerial tool.

A

Approved for public release; distribution unlimited.

A Computer Simulation of Organizational Decision-Making

by

Vincent John Andrews
Lieutenant, United States Navy
B.S., Florida Institute of Technology, 1974

Submitted in partial fulfillment of the requirements for the degree of

MASTER OF SCIFNCE IN MANAGEMENT

from the

NAVAL POSTGRADUATE SCHOOL
December 1979

Author: Vincent John Andrews

Approved by: Carson K. Eoyang, Thesis Advisor

Phillip Neal Butler, Second Reader

Ed Fricke, Chairman, Department of Administrative Science

DA Schrady, Dean of Information and Policy Sciences

ABSTRACT

A computer simulation of organizational decision-making is developed based on the Complete Cycle of Choice. The interrelationships between attitudes, individual behaviors, organizational choices, and the environment are represented in terms of matrices and mathematical equations. Statistical analysis of the data generated by the simulation program is performed to discern significant variables and decision-making patterns. Refinements to the basic model are proposed to increase its usefulness as a managerial tool.

TABLE OF CONTENTS

ACKNOWLEDGEMENT

An essential requirement of this thesis was to develop a computer program which accurately simulates the interplay of key variables in the decision-making process. The author wishes to thank Ms. Pat Meadows for her patience and cooperation in this endeavor. Her assistance and instruction in the finer points of programming were instrumental to the success of this project.

I. INTRODUCTION

The prospects for obtaining the desired levels of personnel to adequately man our armed services look very bleak in the 1980's. That is, of course, based on projections of current policies of recruitment, attrition, and allocation of personnel. Currently more than 80% of enlisted recruits leave before completing five years of service (Defense Manpower Report, 1976)..

Since the military services have virtually no provisions to directly fill billets at intermediate or higher levels with personnel from the general population they must rely on a flow of people who have "come through the ranks." It is for this reason that the currently low levels of enlisted recruitment and high levels of attrition are matters of great concern.

In order to attack this problem military personnel management strategies have emphasized training, turnover rates, recruiting and other macro-level variables. By manipulation of these variables DoD hopes to influence individuals to react in ways to alleviate the manpower problem.

Recent work by Thomas Schelling (Schelling, 1978) discusses at great length the inherent difficulties of predicting individual behaviors on the basis of aggregate or macro-level factors and vice versa. Since it appears that DoD may be trying to do just that when it formulates its manpower strategies, a closer look at some of the many possible interrelationships between the attitudes and intentions of individual persons and the social aggregate they comprise seems very appropriate.

This study will begin with a review of Schelling's work, particularly his models of the ways that expectations can influence behavior, and the relationships between people and "their" environment.

The ultimate goal of this thesis is to develop a computer model which will mathematically simulate the interplay of individual level variables such as attitude or individual actions with more macro-level variables such as organizational behavior or environmental outcome. Through various regression and analytical techniques it is hoped that the more influential variables will be discerned. Although primarily theoretical in nature, this process may reveal some key relationships or driving forces which are of use to manpower strategists, as well as decision theorists and scholars of complex organizations.

II. MICROMOTIVES AND MACROBEHAVIOR

The title of this section is taken from Thomas C. Schelling's 1978 book in which he discusses several models of social interaction and collective behavior. He contends that efforts to predict aggregate behavior on the basis of individual intentions or vice versa are highly prone to error. The interrelationships between these factors are often more complex than one being a simple summation of the other. The next few pages are a review of some of Schelling's models.

A. CRITICAL MASS BEHAVIOR

This model is based on a term used in nuclear physics, For our purposes critical mass behavior deals with a situation or activity that is self-sustaining once enough people are engaged in it.

In order to provide a better understanding of the concept we consider the following illustration.

Assume a local recruiter decides to hold a series of weekly meetings for high school students where questions about military careers can be discussed, where training on basic military skills is provided, and hopefully a desire to become part of the military service is developed. Attendance at these meetings is completely optional and the students are free to attend as many or as few meetings as they care to.

Many different factors go into the decision each student makes whether or not to attend a particular weekly meeting. We are interested in those students whose decision to attend is influenced by what they think their schoolmates will do.

One particular student, for example, may attend a meeting if he thinks at least 30% of his fellow students will be there. Another may attend only if he is sure at least 80% of his schoolmates will be attending. Another student may attend even if he thinks no one else will be there. In other words, for everybody whose attendance depends on the attendance he anticipates there is some critical number or proportion which will just convince him to go to the meeting.

By tabulating the number of students who feel a particular value of expected attendance is "just enough" to make them go to the meeting we can determine a frequency distribution.

In cumulative form a frequency distribution curve describes for any number of anticipated attendance, the number of people for whom that number is large enough. At 40 it registers all the people whose critical numbers are no larger than 40. At zero it indicates the number who would attend even if no one else did. At 100 the diagram records everyone except those who never attend.

Figure 2-1 is a cumulative frequency curve of students whose attendance at a meeting depends on the anticipated level of attendance. Assuming a population of 100 students it can be seen from the diagram that there are 2 individuals who will attend the meeting even if no one else is expected to show up. If everyone is expected about 90 will actually attend.

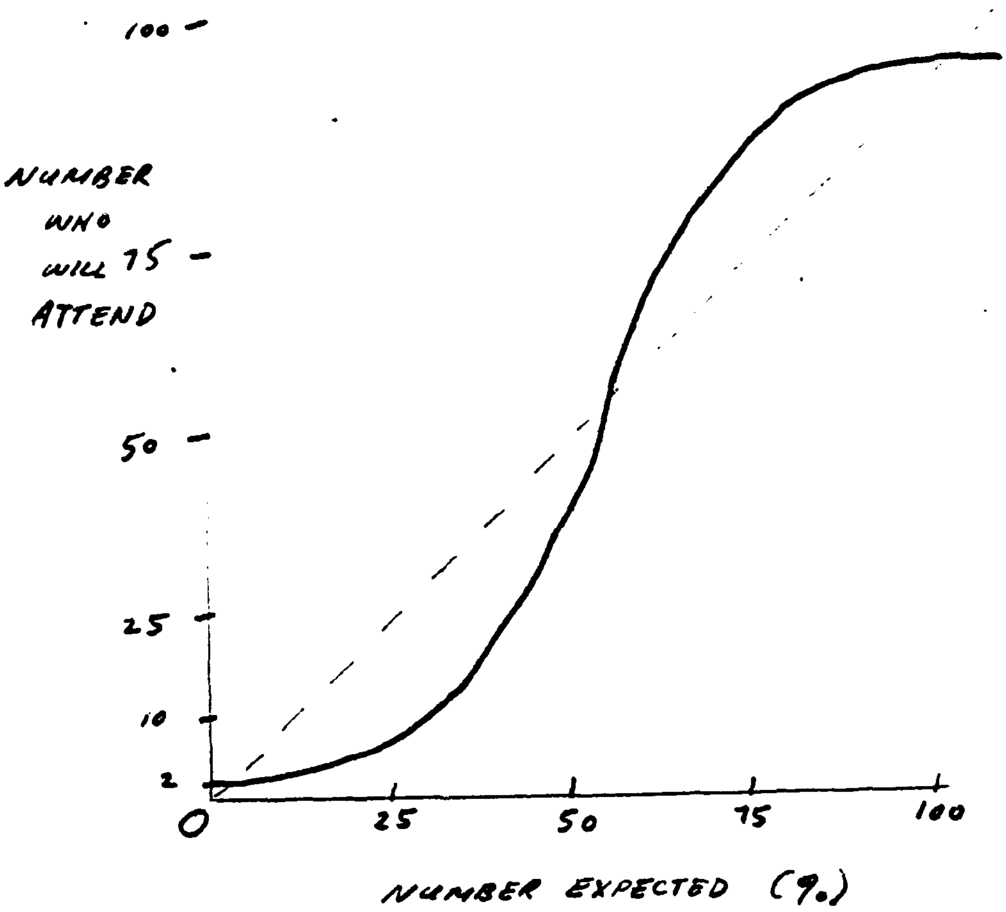

Figure 2-1

Suppose the students each expect 25 or 30 persons to show up for the first meeting. With that expectation about 10 individuals will actually be there. Many of them will be disappointed with only 3 or 4 of them wanting to attend a meeting of 10 people. At the next meeting we should expect a smaller turnout of maybe 3 or 4 people. At this small meeting there will still be some disappointed, and after several more meetings only the 2 diehards will still be attending.

Suppose, that at the first meeting, instead of 25 or 30 persons expected, we have 65 expected. From the diagram we see that nearly 75 will actually show up, and none of them will be disappointed with the attendance. In fact, there are others who would have been present at this meeting had these 75 been expected. Next week if 75 are expected, over 85 will show, and by the following week all will be present except for those who never attend.

Notice that in the first part of our example we had 25 or 30 people expected. Notice also that at this value the distribution curve is below the dashed 45-degree reference line sketched in Figure 2-1. In the second part of our example we had an initial expectation of 65 people. At this value the curve is above the 45-degree reference line. Further examination will reveal that any expected attendances where the curve is below the reference line result in actual attendances that diminish successively to the next lower point where those attending are not disappointed (in this case, where actual attendance is 2). Any expected attendances above the 45-degree line result in actual attendances that increase successively towards the next higher equilibrium point (in this case, actual attendance of 90).

Shifting our attention to Figure 2-2 we see what Schelling calls the "case of the dying seminar" (Schelling, p. 105). Critical mass cannot be achieved. In this situation the number of individuals who show up at a meeting is always less than the number expected. Everyone who attends is disappointed and successively they drop out until no one is left.

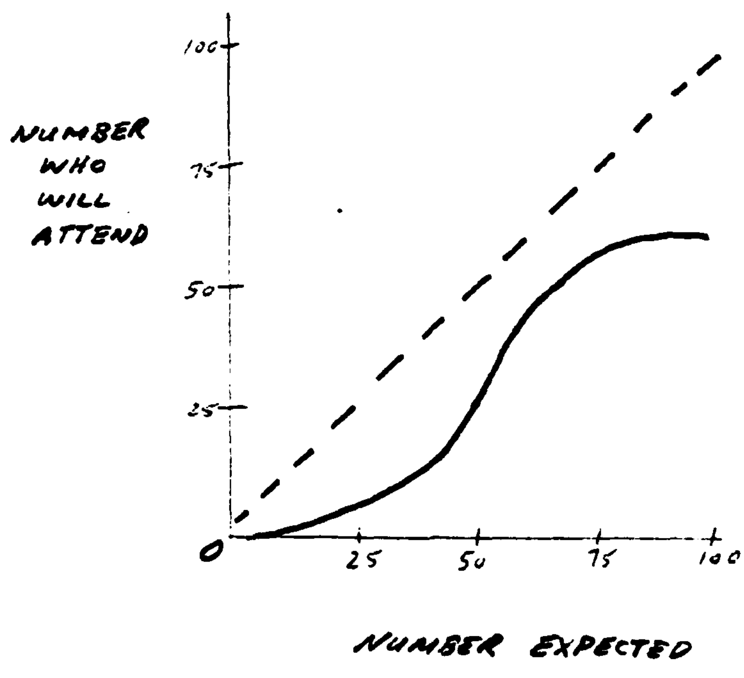

Figure 2-2

Schelling points out that for some behaviors, like language or fashion, it is proportions that influence people, not absolute numbers, while for other behaviors it will be absolute numbers that attract or repel (Schelling, p. 109).

In our preceding discussion we dealt with more than a small, intimate group of students. If we assume that these individuals are more affected by the proportion of their group that is going to the meeting there may be some hope for the recruiter faced with an overall frequency distribution as in Figure 2-2. The hope lies in the possibility of dividing or separating populations. Schelling contends that if people are influenced by local populations — the people they work with, eat with, go to school with, play with, or ride the bus with, any local concentration of the people most likely to display a certain behavior (i.e., go to the meeting) will enhance the likelihood that, at least in that locality, the activity will reach critical mass (Schelling, p. 109).

If the recruiter we described earlier finds himself faced with a population whose behavior is reflected in Figure 2-2 there is an opportunity to avoid a "dying seminar" if he divides his population into more susceptible and less susceptible halves.

To illustrate the usefulness of this idea refer back to Figure 2-2. If the top half of the diagram is cut off; that is, sliced horizontally at 50 on the vertical axis, the lower half remaining describes the population half most easily induced to attend. Disregard the top half of the diagram. Those are the 50 people with the highest critical values.

Looking only at those people from the lower half of the diagram a cumulative frequency distribution for this group by itself can be developed.

Since there are only 1/2 the number of people as in our original population it is necessary to recalibrate the vertical axis to read 100% where it used to read 50. Because the vertical scale has been compressed the 45-degree reference line is replaced by a line with a slope of 1/2. Figure 2-3 shows the outcome.

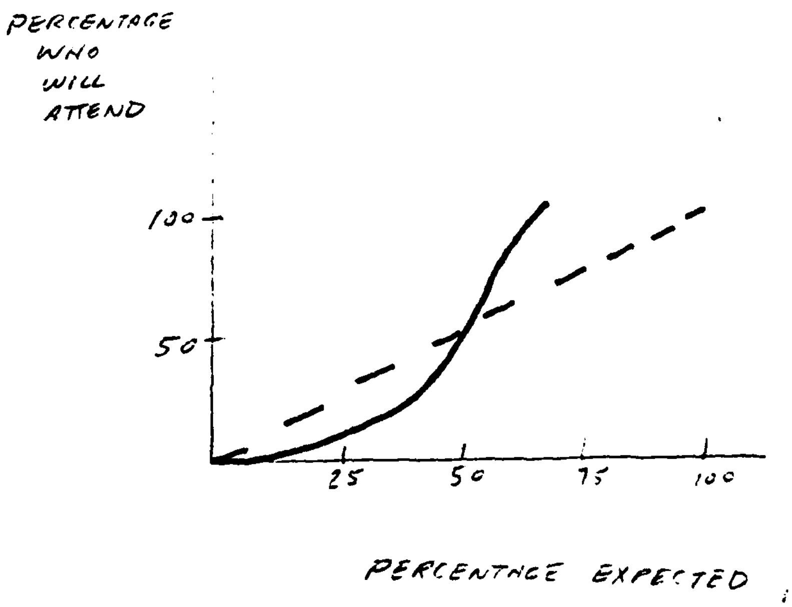

Figure 2-3

As can be seen the curve now has values above the reference line. Since this is the line where the proportion expected exactly equals the proportion attending, any points on the curve above the line are points where critical mass is sustainable. As stated earlier, if it is proportions that matter and not absolute numbers we have created a situation in which full attendance by half the students is now possible. By separating away half the population, in this case those least likely to attend, the influence of everybody who attends is doubled. We have, in effect, doubled the persentage that he or she represents.

Looking at the students in the illustration the recruiter may find that when taken in total as a group of students in grades 9-12 they exhibit the unfavorable behavioral characteristics of Figure 2-2. If he is able to separate them into local populations, for example by grade level, or ethnic group, he may find that certain groups display more favorable characteristics. He may find for example that freshman and sophomores comprise the bulk of the group that is least likely to attend the meetings. By restricting the meetings to only juniors and seniors he may be able to sustain good attendance by this subgrouping of students.

B. SUBCLASSES OF CRITICAL MASS BEHAVIOR

1. Tipping

Tipping is a special case of critical-mass phenomena. It involves people being someplace rather than doing something. According to Schelling the term was first applied to neighborhood migration (Schelling, p. 101). It was observed that the entrance of a few members of a minority into a neighborhood often caused some among the previously homogeneous group to leave. Their departure made space available for more members of the minority to move in. The increase in new residents of this particular race or ethnic background induced more of the old residents to leave, and so on. Motivation for the older residents to depart could be based on the number of minority entrants who had already arrived,or based on some fear that the process would continue forcing them to sell their homes at low prices in the future.

In addition to the process of "tipping out" just described there is the process of "tipping in." As the number of new minority residents grows, the neighborhood becomes more attractive to those of the minority race inducing more of them to move in.

Instead of critical numbers this model uses the term "tolerances." Assuming there is a particular area or organization (e.g. U.S. military) to be in, each person, black or white, has his own tolerance. He will want to be in the organization unless the percentage of members of opposite color exceeds some limit. If a person's limit (tolerance) is exceeded he will go some place else where his color predominates or where his color does not matter. People move out of the organization if the ratio is not within their limit; people outside move in if they see it meets their demands.

If we look at a particular organization (e.g. U.S. Army) we find a certain color ratio exists. Applying the model we find that of two members of the same color the one with the lesser tolerance will leave first as the size of the minority increases. We find that members of a particular color in the organization have higher tolerances than any persons of the same color outside the organization.

Schelling discusses the feasibility of restricting the number of people of majority race allowed to enter. Doing so will often produce a stable equilibrium in otherwise unstable conditions. When there are two or more potentially stable situations where everyone's tolerance level can be satisfied it appears that initial occupancies and rates of movement determine which situation will result (Schelling, p. 164).

The interested reader will find a more detailed analysis of this concept in Schelling's "Dynamic Models of Segregation" (1971).

2. Congestion

Congestion is the case where as the number of people expected to do something increases the desirability of joining in becomes less attractive. An example might be the attendance at an ice skating rink. If the expected attendance is low many people will go because they like the idea of lots of room to skate. If the expectation is that the place will be crowded, few people will go because it's no fun to be out on a crowded rink with no room to move. Figure 2-4 illustrates this idea.

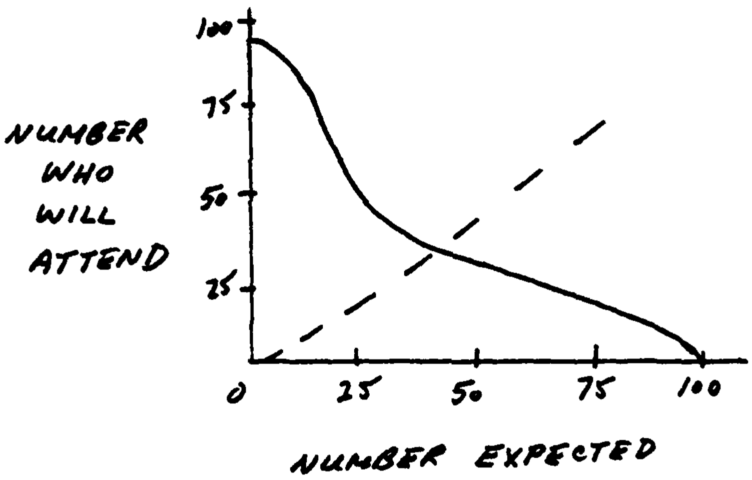

Figure 2-4

3. Commons

This model is closely related to congestion. According to Schelling, "the commons" has come to serve as a paradigm for situations in which people so impinge on each other in pursuing their own interests that collectively they might be better off if they could be restrained, but no one gains individually by self-restraint" (Schelling, p. 111).

The idea originally came from the situation in New England where a common pasture was not only common property of the villagers but also available to their animals for grazing. There were no restrictions on the use of the land, so as long as there was any profit in grazing one's animal on the common, villagers were motivated to do so.

Three levels of usage are possible:

(1) Good Economy: more would be lost than gained by restricting use.

(2) Next level is where every user still benefits but aggregate benefits are reduced by excessive use.

(3) Third level is when there is so much usage as to extinguish the value of the common.

Some applications of the situation above are the common pools of natural resources such as petroleum where the tendency is to overexploit now for quick profits.

In many government organizations there are people exercising tenure, thus preventing the upward movement of more qualified replacements. They stay because they would have to give up their seniority if they moved into a new organization.

C. THE NEED FOR UNDERSTANDING

Hopefully the preceding discussion has made the reader more appreciative of the many possible relationships between individual attitudes, expectations, environmental situation, and aggregate behaviors. Even in cases where population characteristics are known and individual motivations are given the situational outcomes are not always straight-forward or intuitively obvious.

The main intention of this discussion has been to illustrate the potential complexity of relationships between individual attitudes and aggregate behavior, thereby demonstrating the relevance of studying models of social interaction and collective behavior.

The next section of this thesis starts out with a simple model of organizational decision-making and explores the relationships between the variables in much greater depth. The relationships turn out to be much more complex and surprising than would be expected given the simplicity of the basic model.

Since a variety of Navy manpower concerns involve the same variables and similar decision-making situations as those presented in the models it is important that the properties and implications of the models be understood by those in a position to apply them.

III. THE COMPLETE CYCLE OF CHOICE

A. THE BASIC CYCLE

There is a familiar model of organizational learning referred to by March and Olsen as the Complete Cycle of Choice (1975). The cycle starts with an individual person's assessment or attitude about some portion of the environment. Based at least partly on this attitude, and on an assessment of the appropriateness or effectiveness of a particular course of action an individual exhibits some behavior. Individual behaviors are then aggregated into a collective action which is labelled the organizational outcome. This organizational outcome elicits a "response" from the environment. The environment is then reassessed by the individual and the cycle repeats itself. These basic ideas are illustrated in Figure 3-1.

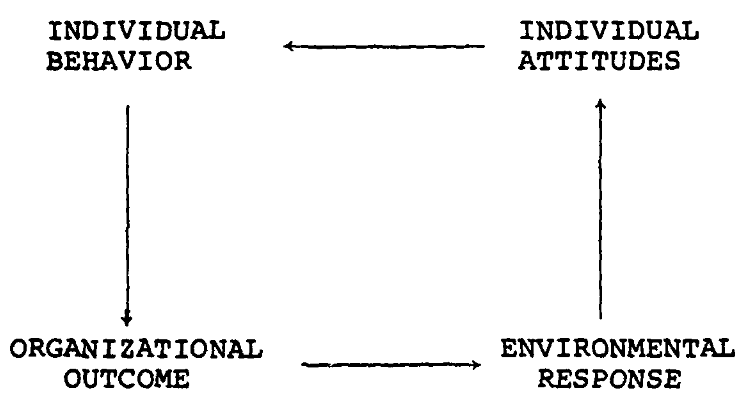

Figure 3-1. COMPLETE CYCLE OF CHOICE

The discussion of critical mass behavior presented earlier is an illustration of the Complete Cycle of Choice. Based on the cues he receives from "his" environment an individual develops expectations about the number of people that will be present at a particular place at a given time. Depending on his own attitudes about the desirability of attending a meeting with the expected number of people he will either attend the meeting or he will choose some alternative course of action. The number of individuals who actually show up at the meeting can be considered the organizational outcome. The organizational outcome leads to an environmental "response" (i.e. a consensus concerning the level of meeting attendance) which is then interpreted by each of the individuals. Based on these interpretations new expectations are formed about the next meeting and the cycle repeats itself.

Although they may be simplistic the ideas incorporated in the cycle provide a useful starting point for theories of organizational behavior. It must be conceded that under certain conditions the model has limitations which make it non-representative of the flow of events. In particular these are occasions where participation in the learning process is fluid, where the organizational processes are not understood, and where goals or attitudes are retro-actively applied to actions that have already taken place. Situations exhibiting these characteristics are sometimes referred to as "organized anarchies" (Cohen and March, 1974).

B. DECISION-MAKING IN ORGANIZED ANARCHIES

Although this thesis is primarily concerned with applications of the Complete Cycle of Choice in rational situations where participation, processes, and outcomes are clearly defined and well understood it seems appropriate to point out some limitations in the model. The model is not designed to be applied to ambiguous, irrational decision-making situations.

Since later sections of this thesis explicitly define situations where the model is most appropriate, this section will describe situations where the Complete Cycle of Choice has substantial limitations. The ability to recognize the occasions where the model is inappropriate is necessary to avoid misapplications.

1. Individual Attitudes and Individual Behavior

Referring to Figure 3-1 it can be seen that the Cycle of Choice assumes a tightly connected closed cycle. March and Olsen (1975) believe that when misapplied the model has limitations which become important such as when one or more of the connections are broken, or confounded by factors not included in the model.

Looking at the linkage between individual beliefs and individual actions March and Olsen suggest that if the notion is accepted that time and energy are scarce resources then it is likely that an individual will have to allocate his time and energy among many choice situations. He will not be able to attend to all the possible choice situations simultaneously.

Individuals are likely to allocate their available time and energy to situations with the highest expected return. They do not act in one area because they are acting in another.

According to March and Olsen (1975), because of other claims on attention it would be possible to have individual attitudes and preferences without behavioral implications in a specific choice situation.

Regulations, standard operating procedures, duties and roles often determine behavior in spite of personal attitudes and preferences. This further serves to suggest a loose coupling rather than a tight connection between individual attitudes and individual actions.

2. Individual Action and Organizational Choice

Looking at the linkage between individual actions and organizational choices or outcomes there is an implication that organizational choice is a direct consequence of individual actions. March and Olsen (1975) suggest that the connection between the two is often quite loose. Sometimes the internal decision-making process is not strongly related to the organizational action. Decision outcomes, however, are not the principal concern of individuals in many choice situations. In particular there is often more importance attached to the allocation and acknowledgement of status, collection and earning of goodwill, exchange of information and ideas, and training.

March and Olsen (1975) illustrate this point with two questions:

a) Why do people fight for the right to participate and then not spend much time participating?

The answer is because most of the status is conferred by the right to participate rather than by the actual activity.

b) Why is there a tendency for major policy decisions to lead to no substantive change?

The answer is because the main concern and pleasure are in the symbolic content of the debate and the education rather than in the implementation of the policy.

It seems likely that a common consequence of making decisions through a process in which most participants are worrying about something else will be decisions that are difficult to anticipate.

The preceding discussion has demonstrated for "organized anarchies" how the internal decision-making process is often loosely connected to organizational outcomes or actions. Sometimes external factors such as economic depression completely change the conditions under which the organization is operating and thereby cause organizational actions independent of any internal decision-making process.

3. <u>Organizational Choice and Environmental Response</u>

The Cycle of Choice assumes a connection between organizational actions and environmental actions. This action by the environment is often viewed as a response to the choices made in the organization. Environmental actions may be better described in terms of relationships among events, people, and other structures rather than merely as responses to what the organization does. The same organizational action will have different "apparent" responses at different times. Different organizational actions will have the same response.

4. Environmental Response and Individual Beliefs

Looking at the last linkage in the cycle of choice it can be seen that environmental events are observed by an individual. Based on his perceptions of what is happening or has happened he may adjust his beliefs accordingly. This experience will hopefully improve his behavior by providing him feedback.

In "organized anarchies" the learning cycle is complicated by the ambiguity of what environmental "response" actually took place. Ambiguity may be inherent in the actual events, or may be caused by the difficulties participants have in observing them. Extremely complex changes in the environment may overpower our mental capacities, and force us to abstract or simplify what has happened, or why it has happened. Often our interpretations of what has happened rely heavily on the interpretation offered by others. The degree of ambiguity will be very dependent on the efficiency of the communication channels through which we receive these interpretations.

C. DECISION-MAKING IN A RATIONAL SITUATION

This thesis will take a closer look at the Complete Cycle of Choice when applied to a relatively unambiguous situation.

In order to exercise the model's performance in its simplest form the thesis considers a situation where the four major variables are closely coupled. It has long been recognized that in more ambiguous cases the linkages between individual attitudes and individual actions may be complicated by limited information-processing capabilities or formal rules of behavior which may overwhelm an individual's freedom to act completely in accordance with his own beliefs. This idea of "bounded rationality" is further developed by Simon (1957).

This discussion, however, will deal with a situation, namely a voting scenario, where the range of behavioral alternatives is fairly well-defined and where the aggregation of individual behaviors through a simple summation to determine an organizational outcome seems plausible. I will assume short time periods in which behavior is permitted to occur in order to minimize the timing effects of different individual actions on the organizational outcome. I further stipulate that the organizational outcome is directly determined by internal processes and that external factors affect the outcome only indirectly.

The organizational action causes an environmental response which may or may not be perceived by the individuals in the organization. Additionally, whether individual belief systems are constructed through self-assessment of the environment or through the interpretations of others can cause different perceptions of a given environment to develop. In this discussion I will deal with well-defined, unequivocal outcomes that leave little margin for severe distortions to develop.

In order to work with the Complete Cycle of Choice in an appropriate situation the model is applied to an election process. I assume a political election with well-defined voting procedures, a limited number of choices, and general agreement on whether a particular candidate has received the majority of the votes, and thereby won the election.

It is believed that imposition of these conditions qualifies this scenario as a rational decision-making situation in accordance with the definition for such a situation as set forth by Karl Weick (1979, pg. 21).

Although Cohen, March, and Olsen (1972) have described ambiguous situations such as college univeristy administration procedures where the decision-making process is more aptly described by their "Garbage Can Theory," I believe that the number of situations which can adequately be illustrated by the Complete Cycle of Choice warrants further research into the model's characteristics.

D. CYCLE OF CHOICE AS COMPUTER PROGRAM

In order to exercise the learning model under various conditions within the constraints previously discussed a computer program has been developed. The program starts out with some specified initial conditions and then by performing various transformations simulates the processes that occur in the theoretical model. After a specified number of iterations through the cycle several summary statistics are generated. These statistics are collected for later discussion and analysis.

1. Initial Conditions

The program first defines some initial attitudinal, behavioral, and environmental conditions. In order to do this a system of matrices was developed. The technique has been used, although in a somewhat different format by Cohen, March, and Olsen in their studies (1972).

In this research I am applying the Cycle of Choice to a voting situation. For each voter an initial preference is assumed of greater or lesser degree for each of three political alternatives in the campaign. This initial attitude or preference for each of the possible choices is represented in terms of strength numbers. In this discussion the first strength number considered will refer to the Republican alternative, the second strength number refers to the Democratic alternative and the third number to some Other alternative. Each individual's attitude can be represented as a 1 x 3 matrix containing three attitude strength numbers. The matrix (.6, .3, .1) indicates that for a particular individual at a particular point in time he considers alternative one, the Republican alternative to be a 0.6 on a scale of 0.0 to 1.0 when ranked relative to the other two possibilities. He considers the Democratic alternative to be a .3 out of 1.0, and the Other alternative to be a 0.1. Alternate numbering schemes could have been chosen to illustrate these preferences but for simplicity this program uses strength numbers which sum to 1.0 over the range of alternatives.

In order to represent a particular individual's behavior at a particular point in time the program employs a 1 x 3 matrix similar to the one used for his attitude. If an individual's behavior is constrained to only one of three possibilities his voting behavior can be represented as three index numbers. Since this illustration, by design, is concerned with a relatively unambiguous situation an individual's behavioral action is defined by the actual lever he pulls in the voting booth. If he does not pull any lever or votes for something other than Republican or Democrat the simulation will classify these as "Other" behavior. The matrix (0,1,0) for example, indicates that this particular individual voted for the second alternative, in this case, the Democratic one. Notice that in this matrix there is a single index number with a value of 1 and the other two have values of zero. In accordance with this model an individual is permitted to act in only one of three possible ways at a particular point in time.

It should be kept in mind that the present discussion is merely describing the techniques employed to represent the major variables in the Complete Cycle of Learning. When this has been completed the discussion will go into detail on the representation of the linkages between the variables.

The next variable to be considered is the organizatinal outcome. Like individual behavior it is represented as a 1 x 3 matrix. Based on the actions taken by the majority of the voters a particular political alternative becomes the organizational decision. The mechanics of this process are described in a later section on linkages.

The last variable to be represented is the environmental situation. In order to describe the environment at a particular point in time a 1 x 3 matrix is employed. As in the individual behavioral matrix we represent the environmental response to the voting process by a series of index numbers. In this example it seems reasonable that in a political election there is generally consensus among the participants on how it will be known that a particular outcome was attained or not. If we stipulate that only one of three possible outcomes can result from the process then a matrix of zeroes and a one will adequately describe the situation. The matrix (0,0,1) indicates that at a particular point in time the environmental outcome was generally agreed to be the third alternative. In this case the alternative other than the Republican or Democratic options was attained.

2. Linkage 1: Individual Attitude Formation

In the representation of the learning cycle I state that an individual's attitude in the current time period is a weighted sum of the environmental outcome and his attitudes in past periods. Implicit in the statement is the notion that an individual's current attitude is also dependent upon orgahizational outcomes and individual behaviors in past periods. That is because these factors serially led from one to another and ultimately led up to the environmental outcomes and attitudes which are currently being considered.

It may be asked why there is no direct provision for an individual to consider future implications of current activity. Studies by the Social Science Research Council seem to show that consideration of just past behaviors is adequate for predictive purposes. They found that by assuming the probability of an individual voting for a particular party is equal to the frequency with which he has voted for that party in recent past periods they obtained results as accurate as the public opinion polls (Mosteller, 1949).

Alfred Schutz provides an additional reason which helps justify the omission of explicit future consideration in this model.

> The actor projects his action as if it were already over and done with and lying in the past. It is a full blown, actualized event, which the actor pictures and assigns to its place in the order of experience given to him at the moment of projection. Strangely enough, therefore, because it is pictured as completed, the planned act bears the temporal character of pastness ... . The fact that it is thus pictured as if it were simultaneously past and future can be taken care of by saying that it is thought of in the future perfect tense. (Schutz, 1967)

Since this research deals with a situation where mechanisms are well-defined and cues are non-ambiguous it is likely that a general consensus of which outcome was attained is possible. This should enable us to use the same environmental outcome matrix as an input in the determination of each individual's current attitude. As in the real world, the specific values in the environmental matrix can change over time, but for a single period in time we will consider only one value of the matrix as an input to the next iteration of the learning cycle.

In addition to the environment, past attitudes are a factor in determining current attitude. Partisanship in the current period may depend on the strength of attitudes held in earlier periods, or be greatly affected by preferences that have become detached from the current situation over many periods of time.

3. <u>Linkage 2: Individual Behavior Determination</u>

In order to make the transition from individual attitude to individual behavior the following procedure is proposed. An individual's anticipated behavior is assumed a weighted sum of his current attitude and his past behaviors. His current attitude for a given alternative is relevant because its magnitude has significance. McPhee refers to this as voter interest and compares it to the notion of "indifference" curves found in economic theory (McPhee, 1962). If a particular political campaign has great appeal, and thereby results in strength numbers of high value for one or two alternatives, then the voter response level could be high. If the contest is a dull one, the strength numbers for the Republican, and Democratic alternatives might both be low, and the individual response might be not to vote at all. In this model that would be classified as an "Other" action. In other words the attitudinal matrix indicates the relative ranking of the alternatives as well as giving an indication of whether or not any action is to occur at all.

In addition to the influence of current attitude past behaviors influence the determination of current behaviors. Besides the statistical significance which the Social Science Research Council found in 1949, the formation of voting habits, or traditions suggest the importance of past behaviors on current behavior. The earlier quotation from Schutz reaffirms the possible role of behavior being considered as if it had already taken place.

The computer program represents the linkage to individual behavior as a probability equation with appropriate likelihoods assigned to each of the different behavioral alternatives. These likelihoods directly incorporate the effects of past behaviors and current attitude.

The specific behavioral action taken by an individual is then probabilistically determined basing the result on these likelihoods.

4. Linkage 3: Determination of Organizational Outcome

There are four broad types of theories used to describe the processes involved in major political decisions. Specifically they are referred to as democratic theories, interest group theories, decision process theories, and legal-bureaucratic theories (Stava, 1971).

In order to keep the situation relatively simple the democratic theory has been assumed. The democratic theory assumes an "electorate" delimited according to specific criteria such as formal position or period of membership in the organization. This electorate decides policy according to certain decision-making procedures. Whenever choices are made the alternative selected and enforced is the alternative most preferred by the electorate. In choosing among alternatives, the one preferred by the greater number is selected. The theory also stipulates that voters are considered basically equal to one another when the votes are counted (Ibid, 1971).

This process is simulated in the computer program by algebraically summing the behaviors of all individuals. The alternative receiving the majority of the votes is defined as the organizational outcome. A 1 x 3 matrix analagous to the behavior matrix is used to represent this outcome.

Since the point of this reserach is to explore the Complete Cycle of Choice in its simple form explicit consideration of critical mass behavior or social interaction effects has been omitted. Inclusion of these factors as refinements to the model is recommended in future studies.

5. Linkage 4: Environmental Response to Organizational Decision

Earlier sections of this thesis have discussed in great detail the particular characteristics of the voting scenario which allow us to say that there will be general consensus among the participants that a particular outcome has been attained. We consider the environment at this point in the cycle to be an output of organizational action. Because of the close coupling designed into the voting scenario we will mathematically portray the environmental outcome as being equal to the organizational outcome. In other situations this may not be appropriate but for this one there seems to be enough well-defined mechanisms and cues to permit it.

After the environmental outcome has been determined it is used as input to the formulation of new individual attitudes, and the cycle repeats itself.

In order to simultaneously consider the attitudes and behaviors of more than one individual a matrix has been used to store the values of all individuals' attitudes, and a second matrix is used to store everyone's behaviors in a given time period. These matrices were developed to facilitate the processing of several individual's behavioral and attitudinal changes in one single operation rather than computing each individual's spearately. Appendix B provides illustrations of these matrices and several others which streamlined the computations. The organization was arbitrarily defined to consist of fifteen individuals. Other numbers could have served just as well.

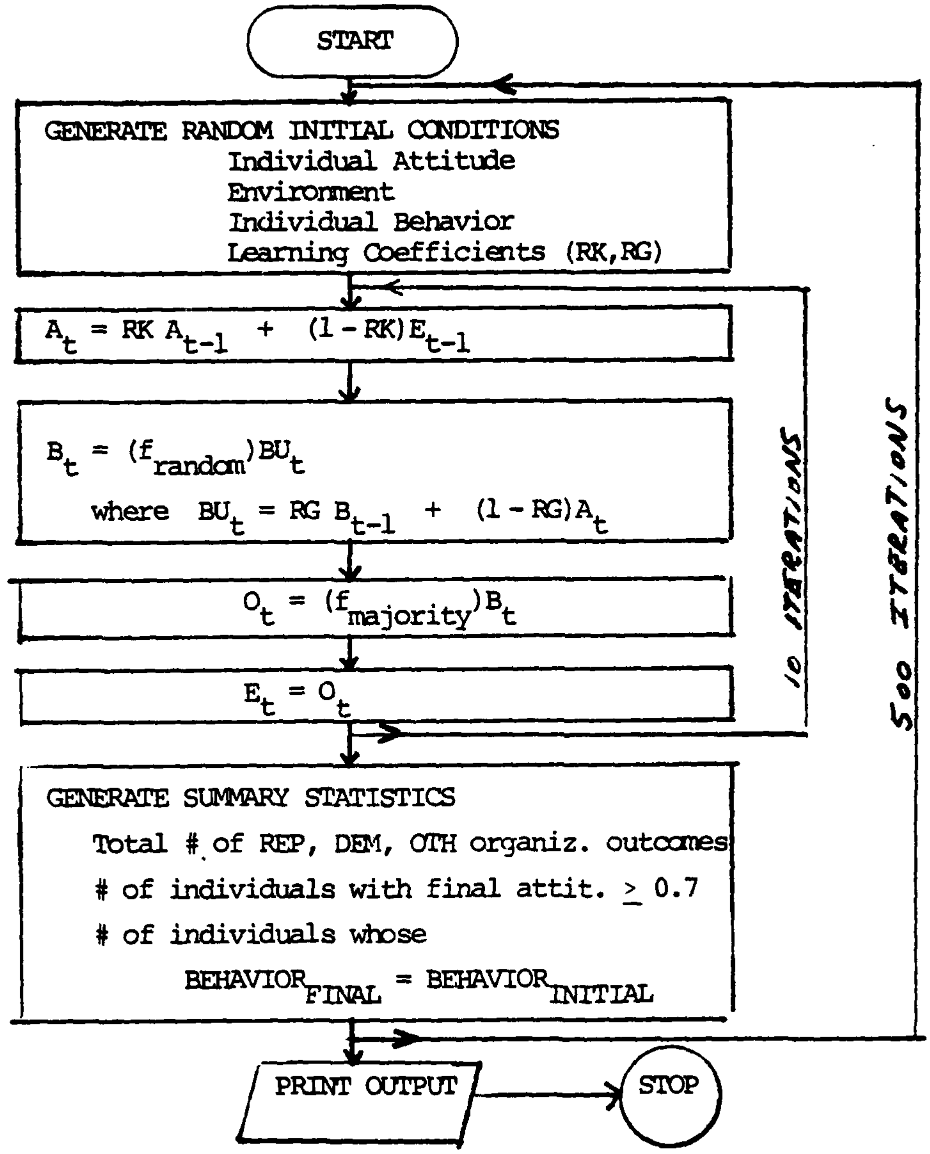

Figure 3.2. FLOWCHART: COMPUTER SIMULATION OF CHOICE CYCLE

Explanation of Symbols and Abbreviations Used in Flowchart of Learning Cycle

A_t = Individual attitude in period t

BU_t = Anticipated individual behavior in period t

B_t = Actual individual behavior in period t

E_t = Environmental response in period t

E_{t-1} = Environmental response in period t-1

f_{random} = Probabilistic function used to determine actual individual behavior (B_t) based on knowledge of anticipated individual behavior (BU_t) in period t.

$f_{majority}$ = Arithmetic function used to determine organizational outcome (O_t) based on actual behaviors of majority of individuals.

O_t = Organizational outcome in period t.

RK = Attitudinal learning coefficient used as weighting factor in equation for determining individual attitude (A_t).

RG = Behavioral learning coefficient used as weighting factor in equation for determining anticipated behavior (BU_t).

10 Iterations = Number of times the learning cycle is completed using a single set of initial conditions.

500 Iterations = Number of sets of initial conditions that are randomly determined and used as inputs to the learning cycle.

Summary Statistics =

1) counts of the number of organizational outcomes for each of three alternatives.

2) counts of the number of individuals out of a total population of 15 individuals whose attitude in the final period is ≥ 0.7.

3) counts of the number of individuals out of a total population of 15 individuals whose final behavior equalled their initial behavior.

IV. ANALYSIS OF SIMULATION DATA

A. INITIAL CONDITIONS AND SUMMARY STATISTICS

The computer simulation of the Complete Cycle of Choice employs initial attitudes, initial behaviors, initial environmental outcomes, and learning coefficients as inputs to the model. In order to exercise the model under different combinations of these inputs a Monte Carlo sampling technique has been used to obtain a manageable number of cases that adequately represent the entire population of possible cases. This follows an analytic procedure developed by Cyert and March (1963).

Referring to Figure 3-2 it can be seen that a set of initial conditions is generated at the start of the learning cycle. After an arbitrary number of iterations (in this case 10) a new set of initial conditions is generated for the next series of iterations through the cycle. This research will examine the performance of the model in relation to 500 sets of randomly generated initial conditions.

Figure 3-2 also indicates that after the arbitrary number of iterations through the cycle several summary statistics are generated. The number of Republican organizational outcomes in 10 periods, the number of Democratic organizational outcomes in 10 periods, and the same for the Other Organizational Outcomes are the first three statistics. The next three statistics are counts of the number of individuals in a population of 15 individuals whose final attitude for the Republican party is greater than or equal to 0.7, the number whose final attitude for the Democratic party is greater than or equal to 0.7, and the number whose final attitude for the Other alternative is grea-er than or equal to 0.7. Preferences above 0.7 will be considered "strong" preferences for discussion purposes (McPhee, 1971, pg. 473). The last statistic to be generated is a count of the number of individuals whose final behavior is equal to their initial behavior.

B. FREQUENCY DISTRIBUTIONS OF THE DATA

A frequency table was obtained for each of the variables employed in the model using the Statistical Package for the Social Sciences (SPSS). The behavioral and attitudinal learning coefficients were distributed evenly among all the different possible values. The initial attitudinal preferences tended to be at the lower end of the scale. The mean value of the initial preferences was .33 for all three political alternatives. Looking at initial individual behavior there appears to be an equal distribution of votes for each of the three parties. The initial environmental outcomes were evenly split amongst the three possible alternatives (see Appendix C for frequency analysis printout).

The results of the frequency analysis of the initial conditions are not surprising since the values were all randomly generated. Initial conditions were not obviously biased towards any one political alternative in particular. For that reason the values of the summary statistics generated as output of the model are somewhat unexpected. Frequency plots of the number of organizational outcomes show 187 cases where 10 out of 10 organizational outcomes were Republican. The Democratic alternative was chosen by the organization 10 out of 10 times in 111 cases, while the Other alternative was chosen 10 out of 10 times in 102 cases. These figures are interesting in two respects. First it seems to be a characteristic of the model that the organizational outcome attained in the first period is quite often attined in all the other periods as well. This pattern was apparent in 400 out of the 500 cases analyzed. The second trend revealed in the frequency plots was that out of a total of 5000 organizational choices made during the exercise of the model 2,324 were for the Republican alternative while only 1,440 were Democratic, and 1,236 were Other. Similar results were obtained during an earlier exercise of the model with 1000 choices. In that earlier simulation 488 Republican, 291 Democratic, and 221 Other Organizational outcomes were attained.

Considering the frequency analysis alone it appears that for a series of learning trials there seems to be a tendency for a single political alternative to be chosen by the organization in all 10 trials of that series. Additionally, although the initial attitudes tended to be at the lower end of the scale the final attitudes were usually greater than 0.7 for the party chosen 10 out of 10 times.

Another pattern to emerge is for one party to be chosen by the organization a significantly larger number of times than the other two alternatives. Perhaps this is due to some combined effect of several variables which will be revealed in the regression analysis.

C. REGRESSION ANALYSIS OF THE DATA

A regression analysis was performed on all 500 cases of the data generated by the computer simulation of the Complete Cycle of Choice. Using the Statistical Package for the Social Sciences a step-wise regression was used to generate "R squared" values. The initial attitudinal, behavioral, and environmental conditions as well as the learning coefficients were considered the independent variables while the summary statistics were treated as dependent values. A table of correlation coefficients between all of the variables was also included in the analysis.

Since the value of the third index (strength) number in the attitudinal, behavioral, and environmental matrices can be directly determined by knowing the first two numbers they were not included as part of the step-wise regressions. With these index numbers omitted the correlation tables showed very low correlations between the independent variables, which is what is desired.

The stepwise regression on the number of Republican organizational outcomes as predicted by the independent variables yielded the following results:

1. <u>Number of Rep Org. Outcomes</u> (Dependent Variable)

Independent Variables	RSQ	ΔRSQ
Init. Environment (Rep. Index)	.197	.197
Init. Individ. Behav. (Rep. Index)	.362	.164
Init. Attitude (Rep. Index)	.396	.034
Behav. Learning Coeff. (RG)	.410	.014
Attitud. Learning Coeff. (RK)	.415	.005

Similarly the Democratic alternative was predicted as follows:

2. <u>Number of Democr. Org. Outcomes</u> (Dependent Variable)

Independent Variables	RSQ	ΔRSQ
Init. Individ. Behav. (Dem. Index)	.262	.262
Init. Environment (Dem. Index)	.385	.123
Init. Attitude (Dem. Index)	.421	.036
Behav. Learning Coeff. (RG)	.431	.010
Init. Environment (Rep. Index)	.436	.005

The independent variables account for approximately 42% of the variance in the dependent variable which is statistically significant for a sample of 500 cases.

At this point it is interesting to note that the ranking of independent variables in the step-wise regression of the number of individuals with strong Republican preferences in the final period, and the step-wise regression of the number of individuals with strong Democratic preferences in the final period was the same as for the rankings just presented (see Appendix D).

These numbers indicate that the number of organizational outcomes for a particular party, as well as strong preferences for that same party are much more sensitive to initial environmental conditions and initial voting behavior than to initial attitudes or learning coefficients. The close correlation between strong final attitudes for a particular alternative and the number of organizational outcomes for that alternative turns out to be exactly .95 as shown in the correlation table in Appendix D. The relatively low correlation between organizational behavior and initial attitudes is shown by the same correlation tables to be .01.

Tying these results to the earlier discussion on the propensity for one party to be chosen in all 10 iterations it seems reasonable to suppose that people in a voting situation are most sensitive to the initial environmental outcome and their own initial behavior. They tend to base their actions in the next period on the same conditions, and so on through the series. This leads to a uniform organizational decision pattern with the party first chosen by the organization, being chosen in every other period. Since the organizational outcome is exactly equal to the environmental outcome the constant exposure to this influential variable causes strong preferences for that particular outcome to develop.

This research has only considered the simple case where the initial attitudes of the individuals are identical. In order to pusue the analysis further a non-homogeneous group is proposed for future research. By using different initial attitudes for each of the individuals in the population it would be possible to better understand the attitudinal changes over a series of elections.

Another interesting variation might be to assign weighting factors to the behaviors of certain individuals in the population. Those with relatively high weights could be thought of as leaders or high-influence groups.

The regression analysis on the number of individuals whose final behavior equalled their initial behavior showed this statistic to be most sensitive to initial Republican behavior. This was unexepected since the initial behaviors were evenly split amongst the 3 alternatives. Further analysis is needed to explain this surprising result.

V. CONCLUSION

The preceding two chapters have developed and analyzed a computer simulation of a basic decision-making model. In particular a voting scenario was the vehicle used to examine the performance of the Complete Cycle of Choice. Three alternatives were considered by the individuals in the discussion, and then each voter made a specific decision. These individual actions were aggregated into a collective behavior, and then the environmental "response" was determined.

This research dealt with a simple decision-making situation in order to keep the model simple. More complex situations would necessitate the formulation of more complex, less obvious models. Many of the models used by corporations and government agencies to formulate strategies or make long-range decisions are implicitly based on the Complete Cycle of Choice. A review of decision models used for top management planning revealed that underlying the detailed complexities of the specific models were the basic information flows and processes of the Cycle of Choice (Ozbekan 1965, Jantsch 1969, Steiner 1969).

Recalling the Navy manpower problem discussed earlier in the thesis there seems to be a similarity between the decision processes involved in choosing to stay in the service, choosing to get out, or choosing some other alternative (e.g., delaying the choice) and the voting scenario described in the simulation. The manpower problem is obviously more complex than the closely connected, well-defined situation analyzed in this thesis. The Complete Cycle of Choice however, appears to be at least a first approximation to the Navy situation. Using the simulations presented in this thesis as a core, it is possible to elaborate, expand, and improve it until it provides a reasonable representation of the actual situation.

The first step towards this end is for manpower strategists to study the operating realities of their system, and to determine the objectives of the simulation. Once the model becomes purposeful, data should be collected and used to determine relationships between the variables. These relationships become the basis for the computer program. The development of the simulation is an iterative process with adjustments made until it provides useful information.

As stated earlier in this section the model presented in this computer simulation is only a first estimate of the Navy manpower situation. One suggested improvement is the consideration of social interraction effects as described in the second chapter of this thesis. The inclusion of critical mass behavior is only a second step towards the development of a useful model but if enough steps are taken the goal will be attained.

Another improvement might be to consider future behaviors and their present implications in the decision process. This thesis found behavioral habits for organizations to develop which we based heavily on the first decision made in a series of decisions. Manpower strategists might want to consider the importance of this in making sure that initial behaviors, especially during the first enlistment term, are favorable to the needs of the Services. The research by Schelling builds heavily on this concept (1978). His discussion of the "dying seminar" yields the same behavior patterns as were obtained in the frequency analysis of the computer simulation. The analysis also found strong preferences to develop based on continued exposure to a particular environment. If manpower strategists find it impossible to develop a "nationwide" environment conducive to the recruiting situation they might want to consider the creation of "local" environments which will encourage a pro-military service attitude to be developed.

In closing it can be said that this research has at least laid out the basic groundwork for future research into one class of manpower models. In choosing the voting scenario I was more interested in the long-term process of political socialization, rather than the prediction of the outcome of a particular election. Successive elections are like successive learning trials. The analysis did not consider single trials but rather the cumulative effects over a longer period of time. Perhaps future researchers will benefit from the discussion presented, and be able to incorporate some of the ideas presented into further improvement of the decision-making model.

APPENDIX A: SIMULATION PROGRAM

```
FORTRAN IV G LEVEL  21                MAIN              DATE = 79345        18/14/39              PAGE 0001

0001            REAL NAMES
0002            DIMENSION A(5,5), F(5,9), R(5,5),BB(5,9), A2(5,5), SUM(3), T2(3)
              1  ,EL(5,5),RFF(2),ACT(3),E2(3),BFC(1)
              1  ,NRCO(3)
              1  ,EK(5,5),FREC(500,3),BENV(500,3),BETH(500,3),TEDC(500,3)
              1  ,CORK(500),CORC(500),EATT(500,3),FWDS(500)
              1  ,X(2),Y(2)
        C FOLLOWING VALUES INDICATE PARAMETERS FOR VECTORS WITHIN MATRICES
0003            NI=500
0004            NR=5
0005            NC=5
0006            NCP=3
0007            NF= NC/NCP
0008            ATT=0.7
0009            CALL OVFLOW
0010            IS=123542
0011            DO 500 LL=1,NI
0012            DO 5 I=1,NCP
0013            NRCO(I)=0
0014          5 CONTINUE
        C FOLLOWING LOOP READS IN INITIAL ATTITUDE MATRIX
0015            CALL RAMAT (NR,NF,IS,A,RFF)
0016          9 FORMAT (16F5.2)
0017          8 FORMAT (1X, 16F5.2 )
0018         10 CONTINUE
0019            EATT(LL,1)=A(1,1)
0020            EATT(LL,2)=A(1,2)
0021            EATT(LL,3)=A(1,3)
        C FOLLOWING LINES READ IN ATTITUDINAL LEARNING COEFFICIENT RK AND
        C BEHAVIORAL LEARNING COEFFICIENT RG
0022            CALL RANRK (IS,RK)
0023            CALL RANRG (IS,RG)
0024         11 FORMAT (//)
0025            CORK(LL)=RK
0026            CORG(LL)=RG
        C FOLLOWING LOOP READS IN INITIAL ENVIRONMENTAL OUTCOME MATRIX
0027            CALL RAMAT (NR,NF,NCP,T2,F,IS)
0028            BENV(LL,1)= F(1,1)
0029            BENV(LL,2)= F(1,2)
0030            BENV(LL,3)= F(1,3)
        C FOLLOWING LOOP READS IN INITIAL BEHAVIORAL ACTION MATRIX
0031            CALL REPAT (NCP,NR,NF,IS,E,ACT)
0032            DO 42 I=1,NR
0033            DO 42 J=1,NC
0034            EK(I,J)= E(I,J)
0035         42 CONTINUE
0036            BETH(LL,1)= EK(1,1)
0037            BETH(LL,2)= EK(1,2)
0038            BETH(LL,3)= EK(1,3)
0039            X(1)=0.
0040            X(2)=1.
0041            Y(1)=0.
0042            Y(2)=15.
0043            DO 200 MM=1,10
        C FOLLOWING SECTION COMBINES ATTITUDE AND ENVIRONMENTAL OUTCOME MATRIX
        C TO DETERMINE THE ATTITUDE-AFTER-LEARNING MATRIX
        C DETERMINE COMPLEMENT OF ATTIT. LRNG. COEFF. AND CALL IT RKC
0044            RKC= 1.- RK
0045            DO 20 I=1,NR
0046            DO 20 J=1,NC
        C MULTIPLY A AND F MATRICES BY ATTIT. COEFFICIENTS RK AND 1- RK
0047            F(I,J) = F(I,J) *RKC
        C COMPUTE ATTITUDE MATRIX AFTER LEARNING HAS OCCURRED
0048            A(I,J)= A(I,J) * RK + F(I,J)
0049         20 CONTINUE
        C MULTIPLY PRESENT ATTITUDINAL MATRIX AND PRESENT BEHAVIORAL MATRIX
        C BY BEHAVIORAL LEARNING COEFFICIENTS
        C  DETERMINE COMPLEMENT OF BEHAV. LRNG. COEFF. AND LABEL IT RGC
0050            RGC = 1. -RG
        C MULTIPLY MATRICES B AND A BY RG AND 1-RG
0051            DO 45 I=1,NR
0052            DO 45 J=1,NC
0053            BE(I,J)= E(I,J) *RG
```

```
0054             AZ(I,J) = A(I,J) + PSC
0055          45 CONTINUE
           C COMPUTE UNSTANDARDIZED BEHAV MATRIX  AFTER LEARNING
0056             DO 50 I=1,NR
0057             DO 50 J=1,NC
0058             BU(I,J)= BB(I,J) + A2(I,J)
0059          50 CONTINUE
           C FOLLOWING SECTION DETERMINES THE ACTUAL BEHAV. MATRIX.
           C ACTUAL BEHAV. IS DETERMINED BY RANDOMLY GENERATING A NUMBER BETWEEN
           C ZERO AND ONE AND LOCATING THE NUMBER ON A SCALE OF PROBABILITIES
           C OF ACTUAL BEHAVIOR.
           C  THESE PROBABILITIES ARE BASED ON THE VALUES IN MATRIX BU
0060             DO 80 I=1,NR
0061             DO 80 K=1,NR
0062             J1=(K-1)*NCF+1
0063             RAA= BU(I,J1)
0064             RBB= BU(I,J1+1)
0065             RCC= BU(I,J1+2)
0066             RBA=RAA+RBB
0067             RC= RBA+ RCC
0068             CALL RANDOM (IS,RPP,1)
0069             II= (RPP(1)*10.+0.5)
0070             RPP= II/10.
0071             IF (RPP.LE.RAA) GO TO 70
0072             IF (RPP.LE.RBA) GO TO 71
0073             B1(1)=0.
0074             B1(2)= 0.
0075             B1(3)= 1.
0076             GO TO 75
0077          70 CONTINUE
0078             B1(1)= 1.
0079             B1(2)= 0.
0080             B1(3)= 0.
0081             GO TO 75
0082          71 CONTINUE
0083             B1(1)=0.
0084             B1(2)= 1.
0085             B1(3)= 0.
0086          75 CONTINUE
0087             DO 78 J=1,NCF
0088             J1= (K-1) *NCF+J
0089             BU(I,J1)= B1(J)
0090          78 CONTINUE
0091          80 CONTINUE
           C NEXT SECTION WILL DETERMINE A SIMPLE MAJORITY SUM FOR REPUBLICAN,
           C DEMOCRAT, OR SOME OTHER ORGANIZATIONAL OUTCOME
           C THE SUM OF :
           C     COLUMNS 1,4,7 OF MAT BU WILL GIVE TOTAL REPUB. VOTE
           C     COLUMNS 2,5,8 OF MATRIX BU IS TOTAL DEMOC. VOTE
           C     COLUMNS 3,6,9 OF MAT BU WILL GIVE TOTAL OTHER VOTS
0092             DO 90 K=1,NCF
0093             SUM(K)=0
0094          90 CONTINUE
0095             DO 95 I=1,NR
0096             DO 95 K=1,NR
0097             DO 93 J=1,NCF
0098             J1= (K-1) * NCF + J
0099             SUM(J)= SUM(J) + BU (I,J1)
0100          93 CONTINUE
0101          95 CONTINUE
0102             BMX = SUM(1)
0103             J1=1
0104             DO 100 K=2,NCF
0105             SUM(K-1) =0.
0106             IF (SUM(K) .LE. BMX) GO TO 100
0107             BMX = SUM(K)
0108             J1=K
0109         100 CONTINUE
0110             SUM(NCF)=0.
0111             SUM(J1)= 1.
0112             NOCC(J1)= NOCC(J1)+1
           C PRINT OUT ORGANIZATIONAL OUTCOME IN A 1 BY 3 MATRIX
           C NEXT SECTION WILL GENERATE AN ENVIRONMENTAL OUTCOME EXACTLY
```

```
      C EQUAL TO THE ORGANIZATIONAL OUTCOME THUS DEMONSTRATING THE
      C CLOSELY COUPLED SITUATION IN THE EXTREME
0113        DO 104 I=1,NCP
0114        Z(I) = SUM(I)
0115    104 CONTINUE
      C PRINT OUT CLOSELY COUPLED ENVIRONMENTAL MATRIX
      C NEXT SECTION WILL CONVERT 1 BY 3 ENVIRON. MATRIX TO A 5 BY 9 FOR USE
      C IN FIRST PART OF LEARNING CYCLE
0116        DO 120 I=1,NF
0117        DO 110 K=1,NF
0118        DO 110 J=1,NCP
0119        J1= (K-1) * NCP + J
0120        E(I,J1) = Z(J)
0121    110 CONTINUE
0122    120 CONTINUE
0123        DO 145 I=1,NF
0124        DO 144 J=1,NF
0125        E(I,J)= EL(I,J)
0126    144 CONTINUE
0127    145 CONTINUE
0128    200 CONTINUE
0129        DO 400 I=1,NP
0130        TREC(LL,I)= NREC(I)
0131    400 CONTINUE
      C  FOLLOWING SECTION DETERMINES THE NUMBER OF INDIVIDUALS
      C WHOSE FINAL ATTITUDE WAS .GE. 0.7 IN PERIOD TEN
      C  THE SECTION ALSO COUNTS THE NUMBER OF INDIVIDUALS WHOSE
      C  BEHAVIOR IN PERIOD TEN = THEIR INITIAL BEHAVIOR
0132        DO 350 K=1,NCP
0133        IAT=0
0134        DO 300 J=1,NF
0135        J1= (K-1)+ (J-1)*NCP+1
0136        DO 300 I=1,NF
0137    325 CONTINUE
0138        IF(A(I,J)).LT.ATT) GO TO 300
0139        IAT=IAT+1
0140    300 CONTINUE
0141        FREQ(LL,K)=IAT
0142    350 CONTINUE
0143        NWES(LL)=0
0144        DO 600 J=1,NF
0145        DO 600 I=1,NF
0146        II=(J-1)*NF+I
0147        DO 595 K=1,NCP
0148        J1= (K-1)+ (J-1)*NCP+1
0149        IF (HK(I,J1).EQ.E(I,J1)) GO TO 595
0150        GO TO 600
0151    595 CONTINUE
0152        NWES(LL)= NWES(LL)+1.
0153    600 CONTINUE
0154        WRITE (6,11)
0155        WRITE (6,458) LL,CORK(LL),CORG(LL),BATT(LL,1),BATT(LL,2),
          1 BATT(LL,3),TREC(LL,1),TREC(LL,2),TREC(LL,3),FREC(LL,1),
          1 FREC(LL,2),FREC(LL,3),NWES(LL),BRCH(LL,1),BRCH(LL,2),
          1 BRCH(LL,3),BRNV(LL,1),BRNV(LL,2),BRNV(LL,3)
0156    458 FORMAT(I4,18F4.1)
0157        WRITE(7,458) LL,CORK(LL),CORG(LL),BATT(LL,1),BATT(LL,2),
          1 BATT(LL,3),TREC(LL,1),TREC(LL,2),TREC(LL,3),FREC(LL,1),
          1 FREC(LL,2),FREC(LL,3),NWES(LL),BRCH(LL,1),BRCH(LL,2),
          1 BRCH(LL,3),BRNV(LL,1),BRNV(LL,2),BRNV(LL,3)
0158    500 CONTINUE
0159    210 FORMAT (/' INITIAL ATTITUDE MATRIX')
0160    215 FORMAT (/' INITIAL ENVIRONMENTAL OUTCOME')
0161    220 FORMAT (/' INITIAL BEHAVIORAL ACTION MATRIX')
0162    225 FORMAT (/' ATTITUDE AFTER LEARNING MATRIX')
0163    230 FORMAT (/' HKC TIMES ENVIRON. MATRIX')
0164    235 FORMAT (/' UNSTANDARDIZED BEHAV. AFTER LEARNING MATRIX')
0165    240 FORMAT (/' STANDARDIZED BEHAV. AFT. LRNG. MATRIX')
0166    245 FORMAT (/' ORGANIZATIONAL OUTCOME MATRIX')
0167    250 FORMAT (/' ENVIRONMENTAL OUTCOME MATRIX')
0168    255 FORMAT (/' CONVERTED ENVIR. OUTCOME MATRIX')
0169    251 FORMAT (/' ACC,NOC,... FOR TEN SIX MATRICES')
0170        STOP
```

```
FORTRAN IV G LEVEL  21              RAMAT              DATE = 79345         18/14/39              PAGE 0001

0001                SUBROUTINE RAMAT (NR,NF,IS,A,REP)
0002                DIMENSION REP(1), A(NR,1)
              C FOLLOWING SECTION WILL GENERATE A 5X9 INITIAL ATTITUDE MATRIX WITH
              C ALL INDIVIDUALS HAVING THE SAME ATTITUDE CONSISTING OF REP., DEM., OR
              C OTH.-R PREFERENCES.
0003            290 CALL RANDOM (IS,REP,2)
0004                II = REP(1) * 10. + 0.0001
0005                REPP= II/10.
0006                II= REP(2) * 10. + 0.0001
0007                DEM= II/10.
0008                IF (REPP+DEM.GT.1.) GO TO 290
0009                OTH= 1.-(REPP+DEM)
0010                DO 300 I=1,NR
0011                K=0
0012                DO 300 J=1,NF
0013                K=K+1
0014                A(I,K)=REPP
0015                K=K+1
0016                A(I,K)= DEM
0017                K=K+1
0018                A(I,K)=OTH
0019            300 CONTINUE
0020                RETURN
0021                END
```

```
FORTRAN IV G LEVEL  21            RANRK            DATE = 79345        18/14/39            PAGE 0001

              SUBROUTINE RANRK (IS,RK)
              DIMENSION RK(1)
      C FOLLOWING SECTION RANDOMLY GENERATES A VALUE OF ATTIT. LRNG. COEFF RK
              CALL RANDCM (IS,RK,1)
              II= RK(1) *10.+0.5)+1
              RK(1)= II/10.
              RETURN
              END


FORTRAN IV G LEVEL  21            RANRC            DATE = 79345        18/14/39            PAGE 0001

              SUBROUTINE RANRC (IS,RC)
              DIMENSION RC(1)
      C FOLLOWING SECT RANDOMLY GENERATES VALUE OF BEHAV. LRNG. COEFF. RC
              CALL RANDCM (IS,RC,1)
              II=RC(1)*10.+ 0.5)+1
              RC(1)= II/10.
              RETURN
              END


FORTRAN IV G LEVEL  21            INMAT            DATE = 79345        18/14/39            PAGE 0001

              SUBROUTINE INMAT (NR,NE,NCP,E2,E,IS)
              DIMENSION E2(1),E(NR,1)
      C FOLLOWING SECTION WILL GENERATE A 1X3 INITIAL ENVIRONMENTAL OUTCOME
      C MATRIX WITH A FFF.,FTN.,CF OTHER OUTCOME SHOWN.
              CALL RANDCM (IS,E2,NCP)
              EMX = E2(1)
              J1=1
              DO 400 K=2,NCP
              E2(K-1)=0.
              IF (E2(K).LE.EMX) GO TO 400
              EMX= E2(K)
              J1=K
          400 CONTINUE
              E2(NCP)=0.
              E2(J1)=1.
      C FOLLOWING SECTION CONVERTS 1X3 INIT. ENVIRON. MATRIX INTO A 5X9 MATRIX
              DO 420 I=1,NR
              DO 410 K=1,NE
              DO 410 J=1,NCP
              J1= (K-1) *NCP+J
              E(I,J1)=E2(J)
          410 CONTINUE
          420 CONTINUE
              RETURN
              END
```

```
FORTRAN IV G LEVEL  21                    SBMAT                DATE = 79345          16/14/39          PAGE 0001

              SUBROUTINE SBMAT (NCP,NC,NF,IS,P,ACT)
              DIMENSION ACT(11), P(NF,1)
      C FOLLOWING SECT WILL CONTRAST A RANDOM TEIT. BEHAV. ACTION MATRIX.
      C IT WILL SHOW ALL INDIVIDUALS VOTING FOR,DEM,OR OTHER
              CALL RANDEX (IS,ACT,NCP)
              BMX= ACT(1)
              J1=1
              DO 500 K=2,NCP
              ACT(K-1) =0.
              IF (ACT(K).LE.BMX) GO TO 500
              BMX= ACT(K)
              J1=K
          500 CONTINUE
              ACT(NCP)=0.
              ACT(J1)=1.
      C RANDOM 1X3 BEHAV. MATRIX IS NOW CONVERTED TO A 5X9 MATRIX
              DO 550 I=1,NN
              DO 540 K=1,NF
              DO 541 J=1,NCP
              J1 = (K-1) * NCP+J
              P(I,J1)= ACT(J)
          541 CONTINUE
          550 CONTINUE
              RETURN
              END
```

THIS [illegible] PRACTICABLE

SAMPLE OF SIMULATION MODEL OUTPUT

```
1 0.9 0.3 0.1 0.6 0.3 1.0 5.0 0.0 0.015.0 0.0 2.0 1.0 0.0 0.0 0.0 1.0 0.0

2 0.3 0.5 0.5 0.5 0.010.0 0.0 0.015.0 0.0 0.015.0 1.0 0.0 0.0 0.0 1.0 0.0

3 0.0 0.7 0.3 0.4 0.310.0 0.0 0.015.0 0.0 0.015.0 1.0 0.0 0.0 1.0 0.0 0.0

4 0.2 0.3 0.4 0.0 0.6 0.010.0 0.0 0.015.0 0.014.0 0.0 1.0 0.0 0.0 1.0 0.0

5 0.4 0.6 0.2 0.1 0.710.0 0.0 0.015.0 0.0 0.015.0 1.0 0.0 0.0 0.0 1.0 0.0

6 0.8 0.8 0.3 0.3 0.410.0 0.0 0.015.0 0.0 0.014.0 1.0 0.0 0.0 1.0 0.0 0.0

7 0.9 0.8 0.4 0.4 0.210.0 0.0 0.015.0 0.0 0.014.0 1.0 0.0 0.0 0.0 1.0 0.0

8 0.9 0.0 0.3 0.0 0.7 0.0 0.010.0 0.0 0.015.0 0.0 1.0 1.0 0.0 0.0 1.0 0.0

9 0.0 0.8 0.1 0.0 0.9 4.0 6.0 0.015.0 0.0 0.0 1.0 0.0 1.0 0.0 0.0 1.0 0.0

10 0.3 0.7 0.8 0.0 0.2 0.0 0.010.0 0.0 0.015.010.0 0.0 0.0 1.0 0.0 1.0 0.0

11 0.3 0.5 0.0 0.2 0.810.0 0.0 0.015.0 0.0 0.0 0.0 0.0 1.0 0.0 1.0 0.0 0.0

12 0.4 0.5 0.1 0.2 0.7 0.010.0 0.0 0.015.0 0.013.0 0.0 1.0 0.0 1.0 0.0 0.0
```

APPENDIX B: SAMPLE OF INTERNAL PROCESSES WITHIN SIMULATION MODEL

```
NUMBER OF THIS SET OF INITIAL CONDITIONS      1


INITIAL ATTITUDE MATRIX
 0.60 0.20 0.20 0.60 0.20 0.20 0.60 0.20 0.20
 0.60 0.20 0.20 0.60 0.20 0.20 0.60 0.20 0.20
 0.60 0.20 0.20 0.60 0.20 0.20 0.60 0.20 0.20
 0.60 0.20 0.20 0.60 0.20 0.20 0.60 0.20 0.20
 0.60 0.20 0.20 0.60 0.20 0.20 0.60 0.20 0.20

VALUES RK AND RG  0.30  0.30


INITIAL ENVIRONMENTAL OUTCOME
 1.00 0.0  0.0  1.00 0.0  0.0  1.00 0.0  0.0
 1.00 0.0  0.0  1.00 0.0  0.0  1.00 0.0  0.0
 1.00 0.0  0.0  1.00 0.0  0.0  1.00 0.0  0.0
 1.00 0.0  0.0  1.00 0.0  0.0  1.00 0.0  0.0
 1.00 0.0  0.0  1.00 0.0  0.0  1.00 0.0  0.0


INITIAL BEHAVIORAL ACTION MATRIX
 1.00 0.0  0.0  1.00 0.0  0.0  1.00 0.0  0.0
 1.00 0.0  0.0  1.00 0.0  0.0  1.00 0.0  0.0
 1.00 0.0  0.0  1.00 0.0  0.0  1.00 0.0  0.0
 1.00 0.0  0.0  1.00 0.0  0.0  1.00 0.0  0.0
 1.00 0.0  0.0  1.00 0.0  0.0  1.00 0.0  0.0
```

NUMBER OF ITERATIONS OF CYCLE 1

ATTITUDE AFTER LEARNING MATRIX

0.88	0.06	0.06	0.88	0.06	0.06	0.88	0.06	0.06
0.88	0.06	0.06	0.88	0.06	0.06	0.88	0.06	0.06
0.88	0.06	0.06	0.88	0.06	0.06	0.88	0.06	0.06
0.88	0.06	0.06	0.88	0.06	0.06	0.88	0.06	0.06
0.88	0.06	0.06	0.88	0.06	0.06	0.88	0.06	0.06

RKC TIMES ENVIRON. MATRIX

0.70	0.0	0.0	0.70	0.0	0.0	0.70	0.0	0.0
0.70	0.0	0.0	0.70	0.0	0.0	0.70	0.0	0.0
0.70	0.0	0.0	0.70	0.0	0.0	0.70	0.0	0.0
0.70	0.0	0.0	0.70	0.0	0.0	0.70	0.0	0.0
0.70	0.0	0.0	0.70	0.0	0.0	0.70	0.0	0.0

UNSTANDARDIZED BEHAV. AFTER LEARNING MATRIX

0.92	0.04	0.04	0.92	0.04	0.04	0.92	0.04	0.04
0.92	0.04	0.04	0.92	0.04	0.04	0.92	0.04	0.04
0.92	0.04	0.04	0.92	0.04	0.04	0.92	0.04	0.04
0.92	0.04	0.04	0.92	0.04	0.04	0.92	0.04	0.04
0.92	0.04	0.04	0.92	0.04	0.04	0.92	0.04	0.04

STANDARDIZED BEHAV. AFTER LRNG. MATRIX

1.00	0.0	0.0	1.00	0.0	0.0	1.00	0.0	0.0
1.00	0.0	0.0	1.00	0.0	0.0	1.00	0.0	0.0
1.00	0.0	0.0	1.00	0.0	0.0	1.00	0.0	0.0
1.00	0.0	0.0	1.00	0.0	0.0	1.00	0.0	0.0
1.00	0.0	0.0	1.00	0.0	0.0	1.00	0.0	0.0

ORGANIZATIONAL OUTCOME MATRIX

1.00	0.0	0.0

ENVIRONMENTAL OUTCOME MATRIX

1.00	0.0	0.0

CONVERTED ENVIR. OUTCOME MATRIX

1.00	0.0	0.0	1.00	0.0	0.0	1.00	0.0	0.0
1.00	0.0	0.0	1.00	0.0	0.0	1.00	0.0	0.0
1.00	0.0	0.0	1.00	0.0	0.0	1.00	0.0	0.0
1.00	0.0	0.0	1.00	0.0	0.0	1.00	0.0	0.0
1.00	0.0	0.0	1.00	0.0	0.0	1.00	0.0	0.0

```
NUMBER OF ITERATIONS OF CYCLE      2

ATTITUDE AFTER LEARNING MATRIX
 0.96 0.02 0.02 0.96 0.02 0.02 0.96 0.02 0.02
 0.96 0.02 0.02 0.96 0.02 0.02 0.96 0.02 0.02
 0.96 0.02 0.02 0.96 0.02 0.02 0.96 0.02 0.02
 0.96 0.02 0.02 0.96 0.02 0.02 0.96 0.02 0.02
 0.96 0.02 0.02 0.96 0.02 0.02 0.96 0.02 0.02

PKO TIMES ENVIRON. MATRIX
 0.70 0.0  0.0  0.70 0.0  0.0  0.70 0.0  0.0
 0.70 0.0  0.0  0.70 0.0  0.0  0.70 0.0  0.0
 0.70 0.0  0.0  0.70 0.0  0.0  0.70 0.0  0.0
 0.70 0.0  0.0  0.70 0.0  0.0  0.70 0.0  0.0
 0.70 0.0  0.0  0.70 0.0  0.0  0.70 0.0  0.0

UNSTANDARDIZED BEHAV. AFTER LEARNING MATRIX
 0.97 0.01 0.01 0.97 0.01 0.01 0.97 0.01 0.01
 0.97 0.01 0.01 0.97 0.01 0.01 0.97 0.01 0.01
 0.97 0.01 0.01 0.97 0.01 0.01 0.97 0.01 0.01
 0.97 0.01 0.01 0.97 0.01 0.01 0.97 0.01 0.01
 0.97 0.01 0.01 0.97 0.01 0.01 0.97 0.01 0.01

STANDARDIZED BEHAV. AFTER LRNG. MATRIX
 1.00 0.0  0.0  1.00 0.0  0.0  1.00 0.0  0.0
 1.00 0.0  0.0  1.00 0.0  0.0  1.00 0.0  0.0
 1.00 0.0  0.0  1.00 0.0  0.0  1.00 0.0  0.0
 1.00 0.0  0.0  1.00 0.0  0.0  1.00 0.0  0.0
 1.00 0.0  0.0  1.00 0.0  0.0  1.00 0.0  0.0

ORGANIZATIONAL OUTCOME MATRIX
 1.00 0.0  0.0

ENVIRONMENTAL OUTCOME MATRIX
 1.00 0.0  0.0

CONVERTED ENVIR. OUTCOME MATRIX
 1.00 0.0  0.0  1.00 0.0  0.0  1.00 0.0  0.0
 1.00 0.0  0.0  1.00 0.0  0.0  1.00 0.0  0.0
 1.00 0.0  0.0  1.00 0.0  0.0  1.00 0.0  0.0
 1.00 0.0  0.0  1.00 0.0  0.0  1.00 0.0  0.0
 1.00 0.0  0.0  1.00 0.0  0.0  1.00 0.0  0.0
```

```
NUMBER OF ITERATIONS OF CYCLE      3


ATTITUDE AFTER LEARNING MATRIX
 0.99 0.01 0.01 0.99 0.01 0.01 0.99 0.01 0.01
 0.95 0.01 0.01 0.55 0.01 0.01 0.99 0.01 0.01
 0.99 0.01 0.01 0.99 0.01 0.01 0.95 0.01 0.01
 0.55 0.01 0.01 0.99 0.01 0.01 0.99 0.01 0.01
 0.95 0.01 0.01 0.99 0.01 0.01 0.95 0.01 0.01


BKC TIMES ENVIRON. MATRIX
 0.70 0.0  0.0  0.70 0.0  0.0  0.70 0.0  0.0
 0.70 0.0  0.0  0.70 0.0  0.0  0.70 0.0  0.0
 0.70 0.0  0.0  0.70 0.0  0.0  0.70 0.0  0.0
 0.70 0.0  0.0  0.70 0.0  0.0  0.70 0.0  0.0
 0.70 0.0  0.0  0.70 0.0  0.0  0.70 0.0  0.0


UNSTANDARDIZED BEHAV. AFTER LEARNING MATRIX
 0.55 0.00 0.00 0.99 0.00 0.00 0.99 0.00 0.00
 0.99 0.00 0.00 0.99 0.00 0.00 0.55 0.00 0.00
 0.99 0.00 0.00 0.59 0.00 0.00 0.99 0.00 0.00
 0.55 0.00 0.00 0.55 0.00 0.00 0.99 0.00 0.00
 0.99 0.00 0.00 0.59 0.00 0.00 0.95 0.00 0.00


STANDARDIZED BEHAV. AFTER LRNG. MATRIX
 1.00 0.0  0.0  1.00 0.0  0.0  1.00 0.0  0.0
 1.00 0.0  0.0  1.00 0.0  0.0  1.00 0.0  0.0
 1.00 0.0  0.0  1.00 0.0  0.0  1.00 0.0  0.0
 1.00 0.0  0.0  1.00 0.0  0.0  1.00 0.0  0.0
 1.00 0.0  0.0  1.00 0.0  0.0  1.00 0.0  0.0

ORGANIZATIONAL OUTCOME MATRIX
 1.00 0.0  0.0

ENVIRONMENTAL OUTCOME MATRIX
 1.00 0.0  0.0


CONVERTED ENVIR. OUTCOME MATRIX
 1.00 0.0  0.0  1.00 0.0  0.0  1.00 0.0  0.0
 1.00 0.0  0.0  1.00 0.0  0.0  1.00 0.0  0.0
 1.00 0.0  0.0  1.00 0.0  0.0  1.00 0.0  0.0
 1.00 0.0  0.0  1.00 0.0  0.0  1.00 0.0  0.0
 1.00 0.0  0.0  1.00 0.0  0.0  1.00 0.0  0.0
```

```
NUMBER OF ITERATIONS OF CYCLE      4


ATTITUDE AFTER LEARNING MATRIX
 1.00 0.00 0.00 1.00 0.00 0.00 1.00 0.00 0.00
 1.00 0.00 0.00 1.00 0.00 0.00 1.00 0.00 0.00
 1.00 0.00 0.00 1.00 0.00 0.00 1.00 0.00 0.00
 1.00 0.00 0.00 1.00 0.00 0.00 1.00 0.00 0.00
 1.00 0.00 0.00 1.00 0.00 0.00 1.00 0.00 0.00


PKC TIMES ENVIRON. MATRIX
 0.70 0.0  0.0  0.70 0.0  0.0  0.70 0.0  0.0
 0.70 0.0  0.0  0.70 0.0  0.0  0.70 0.0  0.0
 0.70 0.0  0.0  0.70 0.0  0.0  0.70 0.0  0.0
 0.70 0.0  0.0  0.70 0.0  0.0  0.70 0.0  0.0
 0.70 0.0  0.0  0.70 0.0  0.0  0.70 0.0  0.0


UNSTANDARDIZED BEHAV. AFTER LEARNING MATRIX
 1.00 0.00 0.00 1.00 0.00 0.00 1.00 0.00 0.00
 1.00 0.00 0.00 1.00 0.00 0.00 1.00 0.00 0.00
 1.00 0.00 0.00 1.00 0.00 0.00 1.00 0.00 0.00
 1.00 0.00 0.00 1.00 0.00 0.00 1.00 0.00 0.00
 1.00 0.00 0.00 1.00 0.00 0.00 1.00 0.00 0.00


STANDARDIZED BEHAV. AFTER LRNG. MATRIX
 1.00 0.0  0.0  1.00 0.0  0.0  1.00 0.0  0.0
 1.00 0.0  0.0  1.00 0.0  0.0  1.00 0.0  0.0
 1.00 0.0  0.0  1.00 0.0  0.0  1.00 0.0  0.0
 1.00 0.0  0.0  1.00 0.0  0.0  1.00 0.0  0.0
 1.00 0.0  0.0  1.00 0.0  0.0  1.00 0.0  0.0

ORGANIZATIONAL OUTCOME MATRIX
 1.00 0.0  0.0


ENVIRONMENTAL OUTCOME MATRIX
 1.00 0.0  0.0


CONVERTED ENVIR. OUTCOME MATRIX
 1.00 0.0  0.0  1.00 0.0  0.0  1.00 0.0  0.0
 1.00 0.0  0.0  1.00 0.0  0.0  1.00 0.0  0.0
 1.00 0.0  0.0  1.00 0.0  0.0  1.00 0.0  0.0
 1.00 0.0  0.0  1.00 0.0  0.0  1.00 0.0  0.0
 1.00 0.0  0.0  1.00 0.0  0.0  1.00 0.0  0.0
```

```
NUMBER OF ITERATIONS OF CYCLE      5

ATTITUDE AFTER LEARNING MATRIX
 1.00 0.00 0.00 1.00 0.00 0.00 1.00 0.00 0.00
 1.00 0.00 0.00 1.00 0.00 0.00 1.00 0.00 0.00
 1.00 0.00 0.00 1.00 0.00 0.00 1.00 0.00 0.00
 1.00 0.00 0.00 1.00 0.00 0.00 1.00 0.00 0.00
 1.00 0.00 0.00 1.00 0.00 0.00 1.00 0.00 0.00

FKC TIMES ENVIRON. MATRIX
 0.70 0.0  0.0  0.70 0.0  0.0  0.70 0.0  0.0
 0.70 0.0  0.0  0.70 0.0  0.0  0.70 0.0  0.0
 0.70 0.0  0.0  0.70 0.0  0.0  0.70 0.0  0.0
 0.70 0.0  0.0  0.70 0.0  0.0  0.70 0.0  0.0
 0.70 0.0  0.0  0.70 0.0  0.0  0.70 0.0  0.0

UNSTANDARDIZED BEHAV. AFTER LEARNING MATRIX
 1.00 0.00 0.00 1.00 0.00 0.00 1.00 0.00 0.00
 1.00 0.00 0.00 1.00 0.00 0.00 1.00 0.00 0.00
 1.00 0.00 0.00 1.00 0.00 0.00 1.00 0.00 0.00
 1.00 0.00 0.00 1.00 0.00 0.00 1.00 0.00 0.00
 1.00 0.00 0.00 1.00 0.00 0.00 1.00 0.00 0.00

STANDARDIZED BEHAV. AFTER LRNG. MATRIX
 1.00 0.0  0.0  1.00 0.0  0.0  1.00 0.0  0.0
 1.00 0.0  0.0  1.00 0.0  0.0  1.00 0.0  0.0
 1.00 0.0  0.0  1.00 0.0  0.0  1.00 0.0  0.0
 1.00 0.0  0.0  1.00 0.0  0.0  1.00 0.0  0.0
 1.00 0.0  0.0  1.00 0.0  0.0  1.00 0.0  0.0

ORGANIZATIONAL OUTCOME MATRIX
 1.00 0.0  0.0

ENVIRONMENTAL OUTCOME MATRIX
 1.00 0.0  0.0

CONVERTED ENVIR. OUTCOME MATRIX
 1.00 0.0  0.0  1.00 0.0  0.0  1.00 0.0  0.0
 1.00 0.0  0.0  1.00 0.0  0.0  1.00 0.0  0.0
 1.00 0.0  0.0  1.00 0.0  0.0  1.00 0.0  0.0
 1.00 0.0  0.0  1.00 0.0  0.0  1.00 0.0  0.0
 1.00 0.0  0.0  1.00 0.0  0.0  1.00 0.0  0.0
```

APPENDIX C: FREQUENCY ANALYSIS OF SIMULATION DATA

ORGLRNG ANALYSIS OF SIMULATION DATA PAGE 3

12/12/79 FILE - NONAME - CREATED 12/12/79

RK ATTIT LRNG COEFF

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
	.0 0.	57	11.4	11.4	11.4
	.1 0.	47	9.4	9.4	20.8
	.2 0.	42	8.4	8.4	29.2
	.3 0.	41	8.2	8.2	37.4
	.4 1.	49	9.8	9.8	47.2
	.5 1.	49	9.8	9.8	57.0
	.6 1.	53	10.6	10.6	67.6
	.7 1.	55	11.0	11.0	78.6
	.8 1.	50	10.0	10.0	88.6
	.9 1.	57	11.4	11.4	100.0
	TOTAL	500	100.0	100.0	

12/12/79 FILE - NONAME - CREATED 12/12/79

RG BEHAV LENG COEFF

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
	.0 0.	55	11.0	11.0	11.0
	.1 0.	45	9.0	9.0	20.0
	.2 0.	50	10.0	10.0	30.0
	.3 0.	48	9.6	9.6	39.6
	.4 0.	63	12.6	12.6	52.2
	.5 1.	54	10.8	10.8	63.0
	.6 1.	42	8.4	8.4	71.4
	.7 1.	40	8.0	8.0	79.4
	.8 1.	55	11.0	11.0	90.4
	.9 1.	48	9.6	9.6	100.0
	TOTAL	500	100.0	100.0	

CRGLENG ANALYSIS OF SIMULATION DATA PAGE 9

12/12/79 FILE - NONAME - CREATED 12/12/79

ATREP INITIAL REP ATT

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
	.0 0.	71	14.2	14.2	14.2
	.1 0.	68	13.6	13.6	27.8
	.2 0.	80	16.0	16.0	43.8
	.3 0.	66	13.2	13.2	57.0
	.4 0.	62	12.4	12.4	69.4
	.5 1.	40	8.0	8.0	77.4
	.6 1.	37	7.4	7.4	84.8
	.7 1.	36	7.2	7.2	92.0
	.8 1.	25	5.0	5.0	97.0
	.9 1.	15	3.0	3.0	100.0
	TOTAL	500	100.0	100.0	

CRGLRNG ANALYSIS OF SIMULATION DATA PAGE 12

12/12/79 FILE - NONAME - CREATED 12/12/79

ATDEP INITIAL DEP ATT

CATEGORY LABEL		CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
	.0	0.	81	16.2	16.2	16.2
	.1	0.	76	15.2	15.2	31.4
	.2	0.	62	12.4	12.4	43.8
	.3	0.	62	12.4	12.4	56.2
	.4	0.	63	12.6	12.6	68.8
	.5	1.	40	8.0	8.0	76.8
	.6	1.	45	9.0	9.0	85.8
	.7	1.	35	7.0	7.0	92.8
	.8	1.	23	4.6	4.6	97.4
	.9	1.	13	2.6	2.6	100.0
		TOTAL	500	100.0	100.0	

ORGLRNG ANALYSIS OF SIMULATION DATA PAGE 15

12/12/75 FILE - NONAME - CREATED 12/12/75

ATCTH INITIAL CTH ATT

CATEGORY LABEL		CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
	.0	0.	69	13.8	13.8	13.8
	.1	0.	89	17.8	17.8	31.6
	.2	0.	68	13.6	13.6	45.2
	.3	0.	67	13.4	13.4	58.6
	.4	0.	59	11.8	11.8	70.4
	.5	1.	35	7.0	7.0	77.4
	.6	1.	34	6.8	6.8	84.2
	.7	1.	37	7.4	7.4	91.6
	.8	1.	23	4.6	4.6	96.2
	.9	1.	11	2.2	2.2	98.4
	1.0	1.	8	1.6	1.6	100.0
		TOTAL	500	100.0	100.0	

CROLRNG ANALYSIS OF SIMULATION DATA PAGE 36

12/12/79 FILE - NONAME - CREATED 12/12/79

BEHREP INITIAL 6TH INDEX REP

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
	0.	[illegible]	65.2	65.2	65.2
	1.	174	34.8	34.8	100.0
	TOTAL	500	100.0	100.0	

CRGLRNG ANALYSIS OF SIMULATION DATA PAGE 38

12/12/79 FILE - NONAME - CREATED 12/12/79

BEHCEN INITIAL 8TH INDEX CEN

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
	0.	334	66.8	66.8	66.8
	1.	166	33.2	33.2	100.0
	TOTAL	500	100.0	100.0	

CRGLRNG ANALYSIS OF SIMULATION DATA PAGE 40

12/12/79 FILE - NONAME - CREATED 12/12/79

BEHOTH INITIAL 8TH INDEX OTH

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
	0.	340	68.0	68.0	68.0
	1.	160	32.0	32.0	100.0
	TOTAL	500	100.0	100.0	

ORGLPNG ANALYSIS OF SIMULATION DATA PAGE 42

12/12/79 FILE - NONAME - CREATED 12/12/79

ENVATP INITIAL ENV INDEX PEP

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
	0.	335	67.0	67.0	67.0
	1.	165	33.0	33.0	100.0
	TOTAL	500	100.0	100.0	

ORGLPNG ANALYSIS OF SIMULATION DATA PAGE 44

12/12/79 FILE - NONAME - CREATED 12/12/79

ENVGEM INITIAL ENV INDEX GEP

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
	0.	323	64.6	64.6	64.6
	1.	177	35.4	35.4	100.0
	TOTAL	500	100.0	100.0	

ORGLPNG ANALYSIS OF SIMULATION DATA PAGE 46

12/12/79 FILE - NONAME - CREATED 12/12/79

ENVGTH INITIAL ENV INDEX GTH

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
	0.	342	68.4	68.4	68.4
	1.	158	31.6	31.6	100.0
	TOTAL	500	100.0	100.0	

ORGLRNE ANALYSIS OF SIMULATION DATA PAGE 18

12/12/79 FILE - NONAME - CREATED 12/12/79

ORGREP REP ORGANIZ OUTCOMES

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
	0.	218	43.6	43.6	43.6
	1.	16	3.2	3.2	46.8
	2.	10	2.0	2.0	48.8
	3.	12	2.4	2.4	51.2
	4.	7	1.4	1.4	52.6
	5.	10	2.0	2.0	54.6
	6.	11	2.2	2.2	56.8
	7.	6	1.2	1.2	58.0
	8.	11	2.2	2.2	60.2
	9.	12	2.4	2.4	62.6
	10.	187	37.4	37.4	100.0
	TOTAL	500	100.0	100.0	

ORGLRNG ANALYSIS OF SIMULATION DATA PAGE 21

12/12/79 FILE - NONAME - CREATED 12/12/79

ORGDEM OFM ORGANIZ OUTCOMES

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
	0.	331	66.2	66.2	66.2
	1.	8	1.6	1.6	67.8
	2.	5	1.0	1.0	68.8
	3.	2	0.4	0.4	69.2
	4.	4	0.8	0.8	70.0
	5.	8	1.6	1.6	71.6
	6.	4	0.8	0.8	72.4
	7.	5	1.0	1.0	73.4
	8.	7	1.4	1.4	74.8
	9.	15	3.0	3.0	77.8
	10.	111	22.2	22.2	100.0
	TOTAL	500	100.0	100.0	

ORGLENG ANALYSIS OF SIMULATION DATA PAGE 24

12/12/79 FILE - NONAME - CREATED 12/12/79

ORGCTH CTH ORGANIZ OUTCOMES

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
	0.	347	69.4	69.4	69.4
	1.	11	2.2	2.2	71.6
	2.	10	2.0	2.0	73.6
	3.	3	0.6	0.6	74.2
	4.	6	1.2	1.2	75.4
	5.	3	0.6	0.6	76.0
	6.	3	0.6	0.6	76.6
	7.	[illegible]	1.2	1.2	77.8
	8.	4	0.8	0.3	78.6
	9.	5	1.0	1.0	79.6
	10.	102	20.4	20.4	100.0
	TOTAL	500	100.0	100.0	

ORGLRNG ANALYSIS OF SIMULATION DATA PAGE 27

12/12/79 FILE - NONAME - CREATED 12/12/79

FREFATT FFF INDIV WITH ATT ABOVE .7

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
	0.	261	52.2	52.2	52.2
	15.	239	47.8	47.8	100.0
	TOTAL	500	100.0	100.0	

ORGLRNG ANALYSIS OF SIMULATION DATA PAGE 29

12/12/79 FILE - NONAME - CREATED 12/12/79

FOEHATT OEH INDIV WITH ATT ABOVE .7

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
	0.	371	74.2	74.2	74.2
	15.	129	25.8	25.8	100.0
	TOTAL	500	100.0	100.0	

ORGLRNG ANALYSIS OF SIMULATION DATA PAGE 31

12/12/79 FILE - NONAME - CREATED 12/12/79

FOTHATT OTH INDIV WITH ATT ABOVE .7

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
	0.	393	78.6	78.6	78.6
	15.	107	21.4	21.4	100.0
	TOTAL	500	100.0	100.0	

12/12/79 FILE - NONAME - CREATED 12/12/79

NWDS NUMBER WHI DTC NOT SWITCH

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
	0.	118	23.6	23.6	23.6
	1.	25	5.0	5.0	28.6
	2.	25	5.0	5.0	33.6
	3.	15	3.0	3.0	36.6
	4.	10	2.0	2.0	38.6
	5.	16	3.2	3.2	41.8
	6.	10	2.0	2.0	43.8
	7.	9	1.8	1.8	45.6
	8.	11	2.2	2.2	47.8
	9.	15	3.0	3.0	50.8
	10.	12	2.4	2.4	53.2
	11.	22	4.4	4.4	57.6
	12.	28	5.6	5.6	63.2
	13.	27	5.4	5.4	68.6
	14.	33	6.6	6.6	75.2
	15.	124	24.8	24.8	100.0
	TOTAL	500	100.0	100.0	

APPENDIX D: REGRESSION ANALYSIS OF SIMULATION DATA

CRGLPNG ANALYSIS OF SIMULATION DATA 12/12/79 PAGE 4

FILE NONAME (CREATION DATE = 12/12/79)

CORRELATION COEFFICIENTS

A VALUE OF 99.00000 IS PRINTED IF A COEFFICIENT CANNOT BE COMPUTED.

	RK	RG	ATREP	ATOPM	ATOTH	ORGREP	ORGOPM	ORGOTH	FORPATT	FOEMATT	FOTHATT	NWES
RK	1.00000	0.02545	0.06533	-0.05779	-0.09967	0.10515	-0.01380	-0.10865	0.00591	-0.01124	-0.13161	0.22144
RG	0.02545	1.00000	0.13621	-0.03796	-0.10752	0.13856	-0.05277	-0.10753	0.17784	-0.14278	-0.18216	0.26159
ATREP	0.06533	0.13621	1.00000	-0.46695	-0.53091	0.19357	-0.13421	-0.05695	0.15331	-0.14066	-0.07525	0.02167
ATOPM	-0.05779	-0.03796	-0.46695	1.00000	-0.52175	-0.10286	0.21180	-0.10610	-0.11666	0.22014	-0.09704	0.04154
ATOTH	-0.09967	-0.10752	-0.53391	-0.52175	1.00000	-0.07744	-0.07679	0.16801	-0.07201	-0.01639	0.16726	-0.05141
ORGREP	0.10519	0.13856	0.18357	-0.10286	-0.07744	1.00000	-0.58054	-0.51987	0.62837	-0.07425	-0.51786	0.10687
ORGOPM	-0.01380	-0.05277	-0.13421	0.21180	-0.07679	-0.58054	1.00000	-0.39336	-0.53365	-0.05149	-0.34704	-0.06975
ORGOTH	-0.10865	-0.10753	-0.06695	-0.10610	0.16817	-0.51987	-0.30331	1.00000	-0.49856	-0.34058	0.54570	-0.14577
FORPATT	0.00541	0.17784	0.15331	-0.13666	-0.07201	0.52637	-0.63369	-0.49856	1.00000	-0.56427	-0.49531	0.05935
FOEMATT	-0.01113	-0.14278	-0.14186	0.22014	-0.07631	-0.07425	0.02049	-0.34058	-0.57427	1.00000	-0.30766	-0.02511
FOTHATT	-0.13131	-0.18216	-0.07525	-0.06704	0.16725	-0.11788	-0.34704	0.54050	-0.49531	-0.30766	1.00000	-0.00456
NWES	0.02144	0.02155	0.02167	0.04154	-0.06161	0.10667	-0.06975	-0.14577	[illegible]	-0.36511	-0.11453	1.00000
BRHREP	0.15674	0.00733	-0.00610	0.00723	-0.01125	0.42222	-0.25487	-0.18659	0.34318	-0.27667	-0.11593	0.40336
BRHOPM	-0.01095	0.04668	-0.02469	0.02564	-0.01514	-0.26167	0.51157	-0.26365	-0.14930	0.40534	-0.21263	-0.16765
BRHOTH	-0.05737	[illegible]	0.03115	-0.03730	0.00627	-0.15798	-0.21536	0.43836	-0.16863	-0.16533	0.35552	-0.34255
ENVREP	0.00153	-0.00141	0.00273	-0.02296	0.01977	0.44414	-0.27021	-0.21811	0.41684	-0.24857	-0.21263	-0.01265
ENVOPM	0.03255	0.00744	-0.01777	0.02202	-0.00439	-0.17665	0.34325	-0.15216	-0.17252	0.23775	-0.16192	0.02525
ENVOTH	-0.13545	-0.08852	0.01555	0.00056	-0.01557	-0.26570	-0.17917	0.38225	-0.24566	-0.05606	0.37958	-0.01632

	BRHREP	BRHOPM	BRHOTH	ENVREP	ENVOPM	ENVOTH
RK	0.15674	-0.01046	-0.14737	0.00198	0.13255	-0.03548
RG	0.00733	0.24668	-0.05920	-0.00141	0.08744	-0.08852
ATREP	-0.00610	-0.02469	0.03115	0.00270	-0.01777	0.01555
ATOPM	0.00723	0.02564	-0.03730	-0.02296	0.02212	0.00056
ATOTH	-0.01115	-0.01514	0.00627	0.01977	-0.00433	-0.01557
ORGREP	0.42222	-0.26167	-0.18796	0.44414	-0.17823	-0.26570
ORGOPM	-0.25487	0.51157	-0.21536	-0.27021	0.34325	-0.17917
ORGOTH	-0.16659	-0.26365	0.43836	-0.21810	-0.15619	0.38225
FORPATT	0.34318	-0.10930	-0.15863	0.41824	-0.17253	-0.24566
FOEMATT	-0.27667	0.40534	-0.16533	-0.24857	0.23775	-0.09605
FOTHATT	-0.11593	-0.21263	0.35552	-0.21263	-0.15192	0.37958
NWES	0.40336	-0.16765	-0.34255	-0.01266	0.02429	-0.01632
BRHREP	1.00000	-0.51506	-0.50117	0.04096	0.02981	-0.07211
BRHOPM	-0.51515	1.00000	-0.42362	-0.34211	-0.01567	0.25576
BRHOTH	-0.50117	-0.42362	1.00000	0.00182	-0.01471	0.01358

PROLFNG ANALYSIS OF SIMULATION DATA 12/12/79 PAGE 5

FILE NONAME (CREATION DATE = 12/12/79)

	BTHREP	ETHDEM	ELECTH	ENVREP	ENVDEM	ENVCTH
ENVREP	0.04050	-0.04217	0.00182	1.00000	-0.51952	-0.47702
ENVDEM	0.02505	-0.01567	-0.01470	-0.51952	1.00000	-0.50315
ENVCTH	-0.07211	0.03976	0.01328	-0.47702	-0.50315	1.00000

THIS PA... PRACTICABLE
FROM COPY ...

ORGLRNG ANALYSIS OF SIMULATION DATA 12/12/79 PAGE 11

FILE ACNAME (CREATION DATE = 12/12/79)

* M U L T I P L E R E G R E S S I O N * * * * * * * * * * * * * * * VARIABLE LIST 1 REGRESSION LIST 1

DEPENDENT VARIABLE.. ORGREP REP ORGANIZ OUTCOMES

SUMMARY TABLE

VARIABLE		MULTIPLE R	R SQUARE	RSQ CHANGE	SIMPLE R	B	BETA
ENVREP	INITIAL ENV INDEX REP	0.44414	0.19726	0.19726	0.44414	4.366354	0.44157
BEHREP	INITIAL BEH INDEX REP	0.60134	0.36161	0.16435	0.42322	3.793641	0.39859
ATREP	INITIAL REP ATT	0.62924	0.39594	0.03433	0.18357	2.561527	0.16258
BG	BEHAV LRNG COEFF	0.63994	0.40952	0.01358	0.13638	1.659656	0.11468
BK	ATTIT LRNG COEFF	0.64385	0.41454	0.00502	0.16519	1.110836	0.07036
ENVDEM	INITIAL ENV INDEX DEM	0.64435	0.41519	0.00065	-0.17665	0.2871683	0.02556
BEHDEM	INITIAL BEH INDEX DEM	0.64464	0.41556	0.00037	-0.24167	-0.2197433	-0.03226
ATDEM	INITIAL DEM ATT	0.64471	0.41565	0.00009	-0.10266	-0.1547033	-0.01073
(CONSTANT)						-0.4183441	

ORGLRNG ANALYSIS OF SIMULATION DATA 12/12/79 PAGE 16

FILE ACNAME (CREATION DATE = 12/12/79)

* M U L T I P L E R E G R E S S I O N * * * * * * * * * * * * * * * VARIABLE LIST 1 REGRESSION LIST 2

DEPENDENT VARIABLE.. ORGDEM DEM ORGANIZ OUTCOMES

SUMMARY TABLE

VARIABLE		MULTIPLE R	R SQUARE	RSQ CHANGE	SIMPLE R	B	BETA
BEHDEM	INITIAL BEH INDEX DEM	0.51157	0.26171	0.26171	0.51157	4.444325	0.48451
ENVDEM	INITIAL ENV INDEX DEM	0.62058	0.38512	0.12342	0.34325	2.842540	0.31454
ATDEM	INITIAL DEM ATT	0.64962	0.42079	0.03567	0.21180	2.521466	0.17368
BG	BEHAV LRNG COEFF	0.65643	0.43090	0.01010	-0.05277	-1.407524	-0.09344
ENVREP	INITIAL ENV INDEX REP	0.66005	0.43567	0.00477	-0.27021	-0.7207583	-0.07561
BEHREP	INITIAL BEH INDEX REP	0.66152	0.43761	0.00195	-0.25467	-0.4705467	-0.05157
ATREP	INITIAL REP ATT	0.66189	0.43810	0.00049	-0.13421	-0.4286677	-0.02520
(CONSTANT)						0.4626512	

ORGLRNG ANALYSIS OF SIMULATION DATA 12/12/79 PAGE 22

FILE NONAME (CREATION DATE = 12/12/79)

* M U L T I P L E R E G R E S S I O N * * * * * * * * * * * * * * * VARIABLE LIST 1
REGRESSION LIST 3

DEPENDENT VARIABLE.. FREPATT REP INDIV WITH ATT ABOVE .7

SUMMARY TABLE

VARIABLE		MULTIPLE R	R SQUARE	RSQ CHANGE	SIMPLE R	B	BETA
ENVREP	INITIAL ENV INDEX REP	0.41834	0.17501	0.17501	0.41834	6.647628	0.41718
BEHREP	INITIAL BEH INDEX REP	0.53058	0.28151	0.10650	0.34318	5.[illegible]	0.32310
ATREP	INITIAL REP ATT	0.56501	0.31923	0.03772	0.19[illegible]	4.525577	0.16682
RG	BEHAV LONG COEFF	0.58611	0.34352	0.02428	0.11784	4.015567	0.15582
RK	ATTIT LONG COEFF	0.58655	0.34439	0.00098	0.06591	-0.7919950	-0.02111
ATDEM	INITIAL DEM ATT	0.58735	0.34455	0.00015	-0.11666	-0.0221453	-0.02741
ENVDEM	INITIAL ENV INDEX DEM	0.58775	0.34546	0.00147	-0.11253	0.1576872	0.02526
BEHDEM	INITIAL BEH INDEX DEM	0.58779	0.34550	0.00005	-0.15000	-0.1254122	-0.00788
(CONSTANT)						0.2762392	

ORGLRNG ANALYSIS OF SIMULATION DATA 12/12/79 PAGE 23

FILE NONAME (CREATION DATE = 12/12/79)

* M U L T I P L E R E G R E S S I O N * * * * * * * * * * * * * * * VARIABLE LIST 1
REGRESSION LIST 4

DEPENDENT VARIABLE.. FDEMATT DEM INDIV WITH ATT ABOVE .7

SUMMARY TABLE

VARIABLE		MULTIPLE R	R SQUARE	RSQ CHANGE	SIMPLE R	B	BETA
BEHDEM	INITIAL BEH INDEX DEM	0.40934	0.16756	0.16756	0.40934	5.455586	0.39150
ENVDEM	INITIAL ENV INDEX DEM	0.53482	0.28604	0.11848	0.33775	4.457872	0.32773
ATDEM	INITIAL DEM ATT	0.57111	0.32616	0.04012	0.22064	4.721671	0.18423
RG	BEHAV LONG COEFF	0.60036	0.36043	0.03427	-0.14256	-4.133507	-0.19741
ENVREP	INITIAL ENV INDEX REP	0.60231	0.36277	0.00235	-0.24857	-0.7752682	-0.05554
BEHREP	INITIAL BEH INDEX REP	0.60351	0.36422	0.00145	-0.23867	-0.6177771	-0.04484
ATREP	INITIAL REP ATT	0.60376	0.36452	0.00030	-0.34088	-0.5073748	-0.01962
(CONSTANT)						1.277167	

ORGLENG ANALYSIS OF SIMULATION DATA 12/12/79 PAGE 22

FILE NONAME (CREATION DATE = 12/12/79)

* M U L T I P L E R E G R E S S I O N * * * * * * * * * * * * * * * * VARIABLE LIST 1
REGRESSION LIST 5

DEPENDENT VARIABLE.. NWOS NUMBER WHO DID NOT SWITCH

SUMMARY TABLE

VARIABLE		MULTIPLE R	R SQUARE	RSQ CHANGE	SIMPLE R	B	BETA
[illegible]	INITIAL [illegible] INDEX [illegible]	0.40336	0.16270	0.16270	0.40336	5.446901	0.42143
RG	REHAV LRNG COEFF	0.47910	0.22954	0.06684	0.26159	5.579421	0.25893
ATDEN	INITIAL D M ATT	0.48155	0.23189	0.00235	0.24154	1.357960	0.05800
[illegible]	INITIAL [illegible] INDEX [illegible]	0.48245	0.23276	0.00087	-0.16765	0.4426264	0.02377
[illegible]	INITIAL [illegible] INDEX [illegible]	0.48325	0.23353	0.00078	-0.01365	-0.5563765	-0.04238
[illegible]	INITIAL [illegible] INDEX [illegible]	0.48388	0.23414	0.00061	0.02959	-0.3625252	-0.02809
ATR[illegible]P	INITIAL R P ATT	0.48434	0.23458	0.00044	0.02167	0.5503563	0.02427
NK	ATTIT LRNG COEFF	0.48437	0.23462	0.00004	0.02144	-0.1261409	-0.00602
(CONSTANT)						3.104011	

THIS PAGE IS BEST QUALITY PRACTICABLE [illegible]

BIBLIOGRAPHY

Aldrich, H.E., Organizations and Environments, Prentice-Hall Inc., Englewood Cliffs, N.J., 1979.

Argyrie, C., and Schön, D.A., Organizational Learning: A Theory of Action Perspective; Addison-Wesley, Reading, Mass., 1978.

Cohen, M.D., and March, J.G., Leadership and Ambiguity, McGraw-Hill, New York, 1974, pp. 2-3.

Cohen, M.D., March, J.G., and Olsen, J.P., "A Garbage Can Model of Organizational Choice." Administrative Science Quarterly, No. 17, 1972, pp. 1-25.

Cyert, R.M., and March, J.G., A Behavioral Theory of the Firm, Prentice-Hall, Englewood Cliffs, N.J., 1963.

Defense Manpower Commission, Defense Manpower: The Keystone of National Security, Report to the President and Congress, April, 1976, pp. 316-325.

Jantsch, E., Perspectives of Planning, OECD, Paris, 1969.

Katz, D. and Kahn, R.L., The Social Psychology of Organizations, John Wiley and Sons, New York, 1966.

March, J.G. and Simon, H.A., Organizations, John Wiley and Sons, New York, 1958.

March, J.G., and Olsen, J.P., Ambiguity and Choice in Organizations, Universitetforlaget, Bergen, Norway, 1976.

March, J.G., and Olsen, J.P., "The Uncertainty of the Past. Organization Learning Under Ambiguity," European Journal of Political Research, 3, 1975.

McPhee, W.N. and Smith, R.B., "A Model for Simulating Voting Systems," Computer Simulation of Human Behavior, John Wiley and Sons, New York, 1971, pp. 471-474.

Mosteller, F. and McCarthy, P.J., The Pre-Election Polls of 1948, Social Science Research Council, New York, 1949.

Nie, N.H., and others, Statistical Package for the Social Sciences. Second Edition. McGraw-Hill, New York, 1975.

Ozbekan, H., "The Ideal of a 'Look Out' Institution." Systems Development Corporation, Santa Monica, CA., 1965.

Schelling, T.C., "Dynamic Models of Segregation," Journal of Mathematical Sociology, 1, 1971, pp. 143-186.

Schelling, T.C., Micromotives and Macrobehavior, W.W. Norton and Company, New York, 1978.

Schutz, A., The Phenomenology of the Social World, Northwestern University Press, Evanston, Ill., 1967, p. 61.

Simon, H.A., Administrative Behavior, Free Press, New York, 1957, pp. 33-41.

Stava, P., The Location of Norwegian District Colleges and Universities, (mimeo). Bergen, Norway, 1971.

Steiner, G.A., Top Management Planning, Macmillan, New York, 1969.

Thompson, J.D., Organizations in Action, McGraw-Hill Company, New York, 1967.

Weick, K.E., The Social Psychology of Organizing, Addison-Wesley, Reading, Mass., 1979.

INITIAL DISTRIBUTION LIST

		No. Copies
1.	Defense Technical Information Center Cameron Station Alexandria, Virginia 22314	2
2.	Library, Code 0142 Naval Postgraduate School Monterey, California 93940	2
3.	Department Chairman, Code 54Js Department of Administrative Sciences Naval Postgraduate School Monterey, California 93940	1
4.	Dr. Denise Rousseau, Code 54Rs Department of Administrative Sciences Naval Postgraduate School Monterey, California 93940	1
5.	Dr. Carson K. Eoyang, Code 54Eg Department of Administrative Sciences Naval Postgraduate School Monterey, California 93940	2
6.	Cdr. Phillip N. Butler, Code 54Zn Naval Postgraduate School Monterey, California 93940	1
7.	Ms. Pat Meadows, Code 54(Pat) Naval Postgraduate School Monterey, California 93940	1
8.	LT Vincent J. Andrews 28 Hofstra Drive Plainview, N.Y. 11803	2