MANAGERIAL PROBLEM DEFINITION: A DESCRIPTIVE STUDY OF PROBLEM DEFINERS

DISSERTATION

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This research examines problem definition as the first step in a sequential problem solving process. Seventy-seven managers in four diverse organizations were studied to determine common characteristics of problem definers. Among the variables considered as differentiating problem definers from non-problem definers were cognitive style, personal need characteristics, preference for ideation, experience, level of management, and type and level of education.

Six hypotheses were tested using the following instruments: the Problem Solving Inventory, the Myers-Briggs Type Indicator Schedule, the Preference for Ideation Scale, the Edwards Personal Preference Schedule, a Problem Definition Exercise, and a Personal Data Questionnaire. Among the managers studied, only twelve were found to be problem definers. Such small numbers severely limit the ability to generalize about problem definers. However, it is possible that problem definers are scarce in organizations.

In terms of cognitive style, problem definers were primarily thinking types who preferred evaluation to ideation in dealing with problems, making judgmental decisions on the basis of collected facts. Problem definers were not predominant at lower levels of the organization. One-third of the

problem definers held upper level management positions while another one-fourth were responsible for specialized activities within their organizations, overseeing special projects and individuals much like upper level managers.

Sixty-eight of the problem definers had non-business educations with none having more than a bachelors degree. As knowledge and judgment on which to base evaluation expands, managers may become less adept at defining problems and more adept at selecting and implementing alternatives. Several tentative hypotheses can be tested in future research including: 1) determining whether problem definers are scarce in organizations, 2) determining whether problem definers are more prevalent in some types of organizations than others, 3) verifying unique cognitive and personal need characteristics, 4) determining whether non-managers rather than managers have problem defining skills.

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INTRODUCTION

Although systems exhibit tendencies toward disorder and randomness, regulation is necessary to maintain order and regularity among the the basic elements of each system. This regulation is required so that the organization's goals may be realized (23, pp. 44-45). The basic principle at work is the preservation of the character of the system--the organization will attempt to cope with deviations from its desired state by ingesting or acquiring control over those forces which threaten goal attainment (25, pp. 244-246). A continuous flow of energy in the form of regulation is necessary to achieve the desired equilibrium or goal.

In organizations, managers are the vehicles by which order, regularity, and nonrandomness are produced. They are charged with responsibility for regulating and preserving the character of organizations. Managers, therefore, must develop the skill which allows them to regulate interacting components within organizations in order to achieve goal attainment. They are expected to develop such skills formally, through educational programs and experientially through their responsibilities in the workplace.

The Problem and Its Purpose

In broadest terminology, the skill of regulating interacting organizational components has been called "problem solving." A deviation from the expected arises, and the manager is asked to assure that, despite the difficulty, the original goal is achieved. This manager seeks to initiate a course of action that will create the desired result and casts about looking for an acceptable alternative. Often, however, a manager rushes into generating and selecting alternatives before isolating the real problem or cause of the deviation (13, pp. 196-199). Since results are paramount, the first workable solution is selected and the manager goes on to other things. Given this approach, the problem is defined as the accomplishment of the predetermined goal.

Drucker has said, "The most common source of mistakes in management decision is emphasis on finding the right answers rather than the right questions" (7, p. 531). Cohen, March and Olsen (5) call this decision making by flight and oversight. Decisions are made to accomplish some goal but which yield no real progress toward resolving problems. Before a problem can be solved, it must first be understood. In order to achieve this understanding, the problem must be defined in such a way as to facilitate its solution. In this way, problem solving first requires an exercise in problem definition.

Mackworth has argued that a fundamental difference exists between problem solving and problem defining (19). However, the process of defining problems is not well understood and seldom well developed among practicing managers (15, 16). The diagnosis involved in problem definition is probably the single most important routine in problem solving since it determines in large part, however implicitly, the subsequent course of action (20, p. 274).

For the most part, problem definition has been subsumed in the problem solving or decision making process. Some authors consider problem solving a broad process that includes decision making while others see problem solving as an element in the decision making process (14, 23, 27). Still other authors treat decision making and problem solving as synonymous for describing a general process of information gathering, analysis, and choice behavior (9, 18). In general, the problem solving and decision making literature assumes that problem definition has somehow occurred: the manager knows what the problem is. It is this assumption that deserves further attention. Dilemmas do not present themselves automatically as problems; they must be formulated in fruitful ways if they are to be moved toward solution (8).

The purpose of this research is to discover problem definers and determine their unique attributes and cognitive characteristics. The personal needs and cognitive characteristics of managers will be examined to gain insight into the process

of problem definition. Such a study would facilitate the development of a body of knowledge regarding problem definition as the initial step in problem solving.

Definition of Terms

To initiate any investigation of problem definition, one must first understand what is meant by the terminology. In searching the literature, the following definitions of the term "problem" were found.

> A problem arises when a decision maker feels reservation about the relative effectiveness of the alternative courses of action (1).
>
> A problem arises when goals sought are not directly attainable by the performance of simple activities available in the manager's repertoire (24).
>
> A problem is a deviation from a standard of performance (12).
>
> A problem is the difference between some existing situation and a desired situation (23).
>
> A problem is a situation that prevents the organization from achieving one or more of its objectives (27).

Ackoff's definition (1) suggests that having alternatives causes problems. Kepner and Tregoe (12) identify a discrepancy between actual and desired states and recognize that the problem could be relative to the individual or the situation. Scheerer (24) believes that a problem requires that novel actions be taken to achieve a goal. This definition implies that a deviation from the norm has occurred and the organization cannot use established procedures to return to the desired state. Pounds (23) acknowledges that a deviation from

the standard or the desired state constitutes the problem. Stoner (27) suggests that problems are related to goals at a group level.

Several common elements can be found in these definitions: desired states, actual states, and goals. Inevitably, a problem is defined in terms of the accomplishment of some goal or desired state. It constitutes a value judgment based on the perception of the individual in terms of questions raised for inquiry, consideration, or solution. For the purposes of this study, a problem will be defined as a perceived difference between an actual state and a desired state. This definition is consistent with the tenets of systems theory in that a steady state or equilibrium is characteristic of an organization as a system. Factors which tend to disrupt the system are countered with forces designed to restore the system as closely as possible to its previous or desired state.

In the context of organizations, the achievement of a desired state must include cognition on the part of the manager. A gap exists between an existing and a desired state on which the manager's attention must be focused. This attention has been called problem finding (14, 19, 23, 26), problem sensing (11), problem formulation (17), and problem solving (15).

Schoennauer (26) defines problem finding as a probing process to find a cause and treat and control it. Bits and pieces of information are collected to try to uncover causal

factors leading to a difficulty. Judgments are delayed until all pertinent data are collected. Lang, et al (14) define problem finding as the detection of the need for corrective action based on a choice between existing and expected outcomes. Mackworth (19) describes it as the investigation of numerous characteristics in an attempt to pinpoint a cause for the possible mismatch of actual and desired states. Kiesler and Sproull (11) suggest that problem sensing is the cognitive process of noticing and constructing meaning about environmental change so that organizations can take action. Lyles and Mitroff (17) believe it is the process of questioning or challenging the current state of affairs to arrive at one or all of the following: well defined goals or objectives, a better understanding of the current situation, or an awareness of potential opportunities. Leavitt (15), on the other hand, sees problem finding as a necessary precondition to problem solving.

As the preceding discussion demonstrates, there is no conceptual agreement on the process by which managers define problems. For purposes of clarification, the term "problem definition" will be used here to indicate this process. Problem definition can be defined as a probing process whereby bits and pieces of pertinent information are collected to pinpoint causal factors which create a gap between actual and desired states. The process of problem definition as defined here must precede the identification and selection of correc-

corrective courses of action to close the gap between the existing and desired states.

Direction of Search for Problem Definers

This research will explore cognitive processes and characteristics of those who must recognize, discover, or rediscover problems and/or their solutions. Basadur (2) has suggested that problem definers can be characterized by a preference for ideation and that creative types make better problem definers. Lyles and Mitroff (17) imply that practice in problem defining, i.e. experience, is necessary for managers to become skilled in this process. Personal characteristics such as curiosity, the need for achievement, dominance, change, autonomy or exhibition may also characterize problem definers. Such needs may influence perception, information processing and motivation, which appear to affect the process of problem definition (21).

On the basis of the diverse literature in the field of cognition, problem solving, decision making, creativity, and information processing, the following model of a problem definer can be developed.

$$PD = f\ (N,C,PI,E)$$

Where

PD = Problem Definer
N = Personal Need Characteristics
C = Creativity/Cognitive Skill
PI = Preference for Ideation
E = Experience

For exploratory purposes, several variables can be used in identifying problem definers and their unique characteristics, assuming that these individuals differ in some significant ways from non-problem definers. These variables would include such things as cognitive style, personal need characteristics, preference for ideation, experience, level of management, and type or level of education.

Focusing on problem defining, several assumptions are made for the purpose of this study. First, it is assumed that the need for problem definers exists in organizations. A second assumption is that unique cognitive processes and personal characteristics can be observed and quantified. The third assumption is that a crucial component of problem defining behavior is noticing and constructing meaning about changes that occur in organizations. And finally, it is assumed that among practicing managers some can be identified who are representative of the universe of problem definers. This particular type of manager might want to have a sound understanding of the problem situation before proceeding with the development of alternative solutions. This person might delay choosing among alternatives while assimilating information to fully understand the nature of the problem to be solved. This person might identify or define the root causes of the problems that attract attention in organizations rather than attacking only symptoms.

Sources of Data and Methodology

Data for this study were collected from eighty-two managers in four medium to large organizations in the Dallas/Fort Worth metropolitan area. The industries represented by these organizations include publishing, banking, packaging, and education.

Managers at all levels of the organization, from first line supervisors to top management, were given a battery of tests designed to probe their personal problem solving characteristics. Each manager received a package of test materials in a controlled setting away from the normal work place. The researcher explained the intent of the research and provided instructions for self-administration of the instruments. Managers were assured of anonymity and confidentiality of their individual test results. Individual results were mailed to each participant.

Each test packet included the following materials:

The Problem Solving Inventory
The Myers-Briggs Type Indicator Schedule
The Preference for Ideation Scale
The Edwards Personal Preference Schedule
A Problem Definition Exercise
A Personal Data Questionnaire

The Testing and Counseling Center located at North Texas State University scored and reported the results of the Edwards Personal Preference Schedule and the Myers-Briggs Type Indicator. Other instruments were analyzed by the researcher.

In an effort to identify the "problem definers" within the sample of managers, the Problem Solving Inventory developed by

Basadur was used. This instrument asks participants to rank order descriptive words which characterize the way they approach problems. The aim of the inventory is to describe how problems are approached rather than to evaluate problem solving ability. Scores are used to develop personal problem solving profiles. Orientations toward experiencing, ideation, thinking, and evaluation are determined with each individual having a dominant orientation toward approaching problems. On the basis of these orientations, the problem definer is hypothesized to be characterized as one who prefers ideation and thinking. Basadur (2) characterizes this person as an assimilator who thinks abstractly, puts ideas together, excels in inductive reasoning, and desires sound understanding. Such an individual tends not to want to proceed toward problem solution until the problem is well defined.

Having selected a group of potential problem definers from among the managers studied, the Myers-Briggs Type Indicator was used to determine unique cognitive skills. It is hypothesized that problem definers are more creative and prefer intuition to sensing and perception to judgment. The intuition/sensing preference measures the tendency of an individual to prefer to look for possibilities rather than to work with known facts. The perception/judgment scale measures the preference for a flexible spontaneous approach to life more than a planned, orderly decided one.

The intuition and perception preferences can be used to identify a preference for ideation also. However, to increase the reliability and validity of this measure, the preference for Ideation instrument developed by Basadur and Finkbiner (3) was used. Basadur, Graen, and Green (4) used this method in a similar manner while studying the effects of creativity training on problem solving. While other instruments for creativity are available, most require a great deal of time and must be administered by expert judges under experimental conditions. Any findings about the creative nature of the subjects studied here are, therefore, limited.

As a crude measure of prior experience, a questionnaire was developed to give an indication of the types and the nature of work assignments experienced by each participant. The questionnaire was designed to determine the nature and extent of responsibility and practice that managers have had in the workplace. Managers were encouraged to elaborate on their problem solving experiences to gain additional insight. Demographic information was solicited also to see if other variables such as age, education, or level of management were unique among problem definers.

To assess personal needs characteristics, the Edwards Personal Preference Schedule was used. This schedule consists of a number of pairs of statements about things that a subject may or may not like or may or may not feel. The subject, through forced choice, indicates which of two statements are

more characteristic of himself or herself so that a personal needs profile is established (6). These profiles can be used to identify the unique personal needs characteristics of problem definers.

To further elucidate the cognitive styles of problem definers, a problem definition exercise was developed by the researcher. A simple situation was described and participants were asked to list as many definitions of the problem as possible. Of all the possible definitions listed, respondents were to select the definition which they felt best described the problem. In this way, approaches to problem solving could be witnessed and compared with cognitive style.

Specific Testable Hypotheses

The following testable hypotheses are postulated from the proposition that problem definers in organizations seek to cope with deviations from desired states by understanding the nature of the problem they are charged with controlling.

> Hypothesis 1: Problem definers have as their chief motivation the desire to thoroughly understand the nature of a problem; therefore, they are intuitive, perceptive, introverted thinkers in distilling disparate observations into integrated explanations.
>
> Hypothesis 2: Problem definers have a high sensitivity and appreciation of ideas; therefore, they prefer non-judgmental, imaginative ideation.
>
> Hypothesis 3: Problem defining skill is developed experientially; therefore, the problem definer will have experience in understanding problems. However, since organizations reward results rather than understanding, the problem definer will likely be in lower positions in organizations.

Hypothesis 4: Problem defining skill is not traditionally taught in schools of business; therefore, the problem definer will have a non-business education.

Hypothesis 5: Problem definers form associations and insights, conceptualize new ideas, and search for integrated explanations; therefore, problem definers have a high need for autonomy, endurance, change, and intraception.

Hypothesis 6: Problem definers prefer not to have to prioritize or implement decision-making; therefore, they will exhibit puzzlement when faced with a problem situation.

The remainder of this paper elaborates on the problem defining process. Chapter two discusses the literature to date on problem definition. Chapter three reveals the methodology used and the makeup of the sample group of managers. Chapter four reports the research findings of the various instruments used in this study. The final chapter discusses the implications of the findings for the field of management as well as future avenues for research.

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Chapter II

THE LITERATURE

Literature concerning problem definition itself is scant. However, relevant literature relating to problem definition can be found embedded in several separate yet related topic areas. These topic areas include problem finding, problem solving, social cognition and type theory, learning and information processing as well as creativity. To begin a study of the nature of problem definers themselves, it is necessary to review the literature in these various fields.

Problem Finding

An early writer distinguishing between problem solving and problem defining was Norman Mackworth. Using the term problem finding, Mackworth identified several reasons for distinguishing between problem finders and problem solvers (21, pp. 242-247).

> 1. Problem finding is more important than problem solving because it contributes new and testable ideas.
>
> 2. Since problem finding is very different from problem solving, broader cognitive processes must be studied to increase our understanding of this process.
>
> 3. The rate at which discoveries are made depends on the number of people who can formulate problems. These individuals have a strong need to find order where none appears on the surface.

The action involved in problem definition is distinct from problem solving in several ways. As can be seen in Figure 1, problem solving is the process of choosing between existing alternatives to find the one solution that will best minimize the difference between the actual and the desired state. Problem finding, however, involves detecting the need for developing new alternatives based on a careful definition of the cause for such a difference. The problem definer must look at data in a fresh way. New plans must be developed which are perhaps more suitable for relating facts than methods previously used. The new plans may allow one to deal with problems that may not have lent themselves to previous attempts at solution.

In an early attempt to understand the problem defining process, Pounds (30) interviewed executives asking them to describe the problems they faced and how they became aware of these problems. He found that these managers had difficulty being explicit about the process by which they selected their problems. However, Pounds was able to identify several models used by managers and suggested that a model might be necessary for individuals to be able to recognize differences between actual and desired states. Such differences act as stimuli triggering managerial behavior. Pounds views problem finding as the process of defining these differences. The observed models included the following:

	PROBLEM SOLVING	PROBLEM DEFINING
Definition	Selection and use of alternatives from an existing set of alternatives.	Detecting a need for developing alternatives by comparing actual against desired states.
Objective	Selection from existing alternatives one that will effectively achieve the desired outcome.	Developing correct alternatives for realizing required results in expected future states.
Method	Experimentation to minimize mismatches between desired and actual states.	Cognitive, intellectual activity to minimize mismatches between desired and perceived actual states.
Outcome	Discovery of one specific acceptable alternative for dealing with a well-defined problem.	Discovering many general questions for pinpointing causes of ill-defined problems.

Adapted from Norman H. Mackworth, "Originality," in The Discovery of Talent, Dael Lee Wolfle, editor, Harvard University Press, 1969.

Fig. 1--Problem Solving and Problem Defining

Historical Models:	Identifying discrepancies from a so-called "normal" past.
Planning Models:	An established minimum level of performance which a manager could be expected to attain and against which progress could be evaluated in terms of discrepancies between the stated goal and progress towards the goal.
Other People's Models:	Customers, employees, or other individuals define problems for the manager. Discrepancies can be identified between expectations and current levels of performance.
Extra-Organizational Models:	An attempt to match accomplishments of another organization and minimize differences between these organizations either in modes of operation, performance levels, or expectations of improvement (30, pp. 7-12).

Livingston (17), in discussing management education, pointed out that little attention is given in formal educational programs to the development of skills required to identify problems. The perceptual skills necessary for identifying problems before they begin to have adverse effects on the organization have not been taught in schools of business where the educational emphasis has been on problem solving and decision making rather than on problem finding. Today's manager, however, must be able to read meaning into changes in methods of doing business and actions of customers or competitors before unexpected declines in profit show up. Such declines are symptomatic of gaps between existing and desired

The manager must pinpoint the cause of the decline before developing alternative solutions.

Leavitt (16) suggested that managers go through a sequential three stage process in dealing with problems--problem finding, problem solving and problem implementation as shown in Figure 2. At each stage of the process, various decisions are made before proceeding to the next stage. One can readily see that Leavitt considers problem finding an important first step in problem solving.

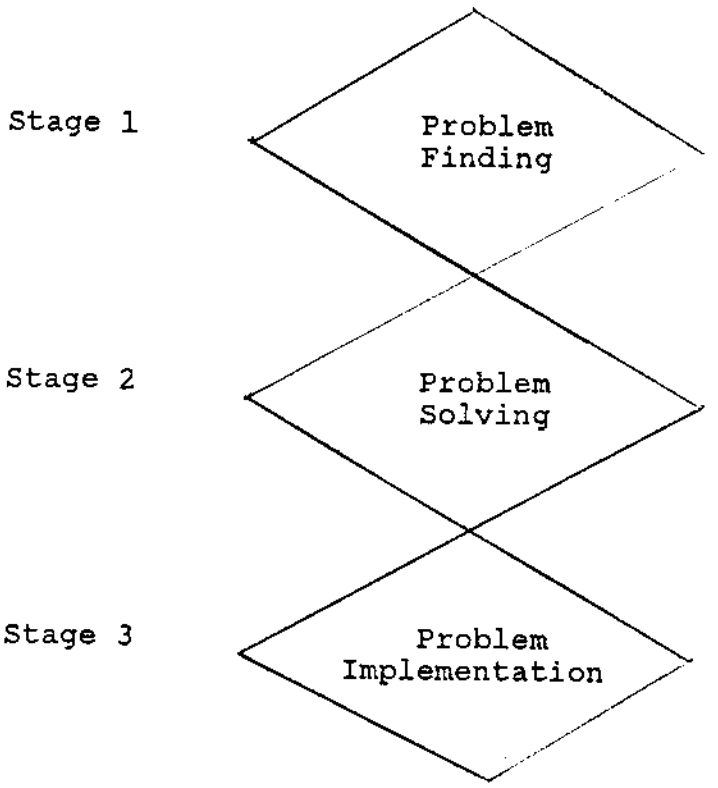

Fig. 2 -- The Three Stage Problem Solving Process

Problem Solving

Management literature abounds on the problem solving process. Most of this literature deals with a series of interrelated steps beginning with a diagnosis of the problem, the gathering of relevant data, and ending with the implementation of a chosen alternative.* This literature focuses attention on selecting alternative courses of action which will correct situations considered to be problematic. Several authors have pointed out that the most common problem solving difficulty is inadequate identification of problems (16, 17, 42). Managers often react to difficulty by looking around for an answer, selecting the first workable solution and then moving on to other things. This approach often works to alleviate the symptoms of problems, but not the problem itself. Simon (35) calls this satisficing.

Meindl (23, p. 676) maintains that how problem requirements are defined influences what will preoccupy a manager's attention. It is the definition that will lead to the advancement of alternative solutions. If the problem is inaccurately defined, improper solutions will result. The process of defining problems, then, becomes an important focal point for management education.

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*See for example: James A.F. Stoner, Management, Englewood Cliffs, New Jersey: Prentice-Hall, Inc., 1982, or Michael H. Mescon, Michael Albert, and Franklin Khedouri, Management, New York, N.Y.: Harper and Row, 1981.

In an effort to understand problem solving in more depth, Lang, Dittrick, and White (15) studied various problem solving models and found commonalities in both their form and content. On the basis of these commonalities, an integrative model, as shown in Figure 3, was proposed which recognized the existence of problem identification activities as precursers to actual problem solving. A look at the model reveals that both information inputs and accumulated knowledge as well as perception affect the problem solving process.

Schoennauer (31) also recognized problem identification as a necessary first step to problem solving. He maintained that it was often difficult to get consensus as to what the real problem was. Often what are identified as problems are really nothing more than weak explanations for a problem's existance. For example, the problem may be defined as a lack of financial resources. This explanation can then be used to avoid a full problem finding search. The lack of funds is used to legitimize the problem and the search for an underlying cause is not pursued. Other common legitimizers identified by Schoennauer include: a lack of leadership, rapidly changing technology, the lack of proper information, a lack of human resources, a rapidly changing environment, and/or scarce resources. All are "explanations" which can prevent full problem definition. Individuals do not necessarily intend to circumvent problem definition. Habituation and general organizational acceptance breed and legitimize such an approach.

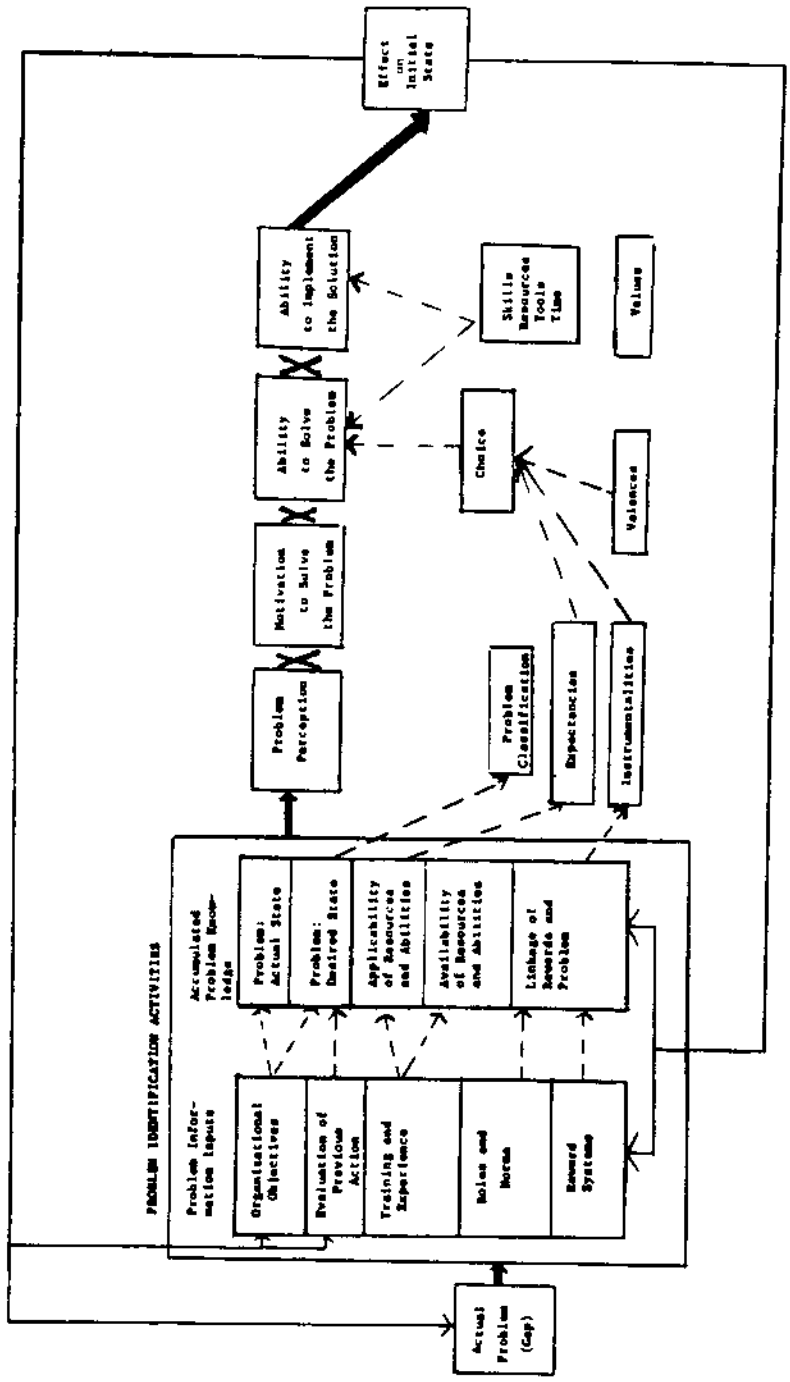

Fig. 3--The Integrated Problem Solving Process

Social Cognition and Type Theory

Also related to the problem defining process is the literature on social cognition and learning behavior. Cognitive processes are the mechanisms by which ideas arise, are maintained and transformed (34). A problem has both a cognitive component, an awareness of the goal, and an evaluative component, a desire to approach the goal or avoid a consequence (18). Literature in this area relates to the processes of noticing, interpreting, and incorporating stimuli in the environment that lead to the identification of potentially problematic situations. Closely related are theories of human information processing which discuss the ability to notice and interpret information.* In this literature, a cognitive process is seen as a sequence of internal states successively transformed by a series of information processes (24, p. 18).

While problem solving is easy to observe, it is not so clearly distinguishable from learning or cognition. Much learning theory emphasizes the cognitive aspects of human adjustment or problem solving. Thinking is used as an omnibus term to describe a wide range of high level cognitive processes. Divergent thinking in particular is important in problem definition where an individual is faced with an open

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*See for example J.S. Bruner "Personality Dynamics and the Process of Perceiving," and "On Going Beyond The Information Given," in Beyond the Information Given, New York, N.Y.: W.W. Norton Company, Inc., 1973. Also see Dewitt C. Dearborn and Herbert A. Simon, "Selective Perception: A note on the Departmental Identification of Executives," Sociometry 21 (June, 1958), pp. 140-144.

ended problem. Here the answer does not necessarily follow in a sequential manner from what has gone before, and a number of solutions may exist for the problem or parts of the problem (33).

Type theory states that variation in human behavior is ordered and consistent. A person may reasonably be expected to develop certain types of perceptual skills. Perception includes the processes of becoming aware of things, people, occurrences, or ideas. Individuals are equipped with two distinct and contrasting ways of perceiving--sensing and intuition. While all persons may use both sorts of perception, they prefer one way of perceiving more than another. The person who prefers sensing will be interested in the actuality around them to the exclusion of listening for ideas out of nowhere. Those who prefer intuition are more interested in all the possibilities that occur to them and may not notice some of the actualities (13).

Whichever process is preferred, the individual will make use of it, pay closer attention to its impressions, and fashion ideas of the world from what it reveals. The other type of perception will be in the background. With constant practice, the preferred process grows more controlled and trustworthy. The individual develops surface traits also that result from looking at life in a particular way. Each individual channels his or her interests and energy into activities that provide an opportunity to use the preferred way (29, pp. 50-51).

Basically there are two ways of coming to conclusions. One way is by the use of thinking, a logical process aimed at an impersonal finding. The other way is by the use of feeling, bestowing on things a personal, subjective value. Once again, each individual tends to like and trust one way of judging more than another. In judging ideas, if one concentrates on whether or not they are true, that is thinking judgment. Concentration first on like or dislike is a feeling judgment. The feeling individual becomes more adept at handling human relationships, while the thinking preference makes one more adept in the organization of facts and ideas (29, p. 52).

The thinking or feeling preference is independent of the sensing or intuition preference. Either kind of judgment can be teamed with either kind of perception. As a result, there are four possible combinations of these characteristics, each of which produces a different kind of personality:

ST Sensing and Thinking

SF Sensing and Feeling

NF Intuition and Feeling

NT Intuition and Thinking

Whatever a person's particular combination of preferences, he or she will be able to get along with and understand others with that same combination best (29, p. 53).

Slocum and Hellriegel (37) use Jung's Type Theory in studying managerial minds. They believe sensing managers are

oriented to realism, external facts, and concrete experiences while intuitive managers like solving new problems, are impatient with routine, and dislike taking time for precision, relying on hunches and unverbalized cues when dealing with problems. Managers who evaluate information by feeling put heavy emphasis on the human aspects in dealing with problems while thinking types make decisions on an analytical, logical basis. The thinking manager would more likely take the rational problem solving approach presented by Simon (35) and discussed as the problem solving process in management texts.

Mitroff believes that an organization's problems can be solved more quickly if the different perceptions of managers are recognized (26). He expands the Jungian typology in discussing an organization's stakeholders. Stakeholders, defined as those parties who either affect or are affected by a corporation's activities (25, p. 4), influence problem definition in organizations. The greater the number of stakeholders, the greater the number of assumptions that will be made about the real nature of the problem. Each group of stakeholders procures data to confirm its belief. In studying the nature of this process, Mitroff identifies four types of individuals with four types of personalities that result in different types of organizations. These types correspond to Jung's typology and, when aggregated in organizations, tend to reinforce and intensify a particular way of looking at the world. Such a phenomenon could result in skewed perspectives

on problems in that individual personalities will affect what will be recognized as valid information on which to base decisions.

Kiesler and Sproull (14) believe that cognitive processes often work in such a way as to make certain kinds of problem sensing behavior or errors in detection more likely to occur. Information processing, social perception and motivation are considered mediating processes that can enhance or inhibit the problem defining process. As can be seen in Figure 4, by incorporating these mediating processes into a problem solving model, the outcome closely resembles the integrated problem solving model presented by Lang, et. al.

Information Processing

A well prepared managerial mind arranges, rearranges, and transforms information in such a way that it can go beyond the tangible evidence and gain additional insights (5). Tangible evidence takes the form of information that acts as stimuli arousing interest on the part of the individual. However, choice may precede information search. The individual must make several choices when faced with a problem. He can search for pertinent information, decide the problem is similar to another that has been experienced and offer similar solutions, or decide the problem is not worthy of his attention. Information, then, acts as stimuli capable of altering individual expectations and evaluation (43). Simon's concept of bounded rationality is illustrative. Individuals have limits to

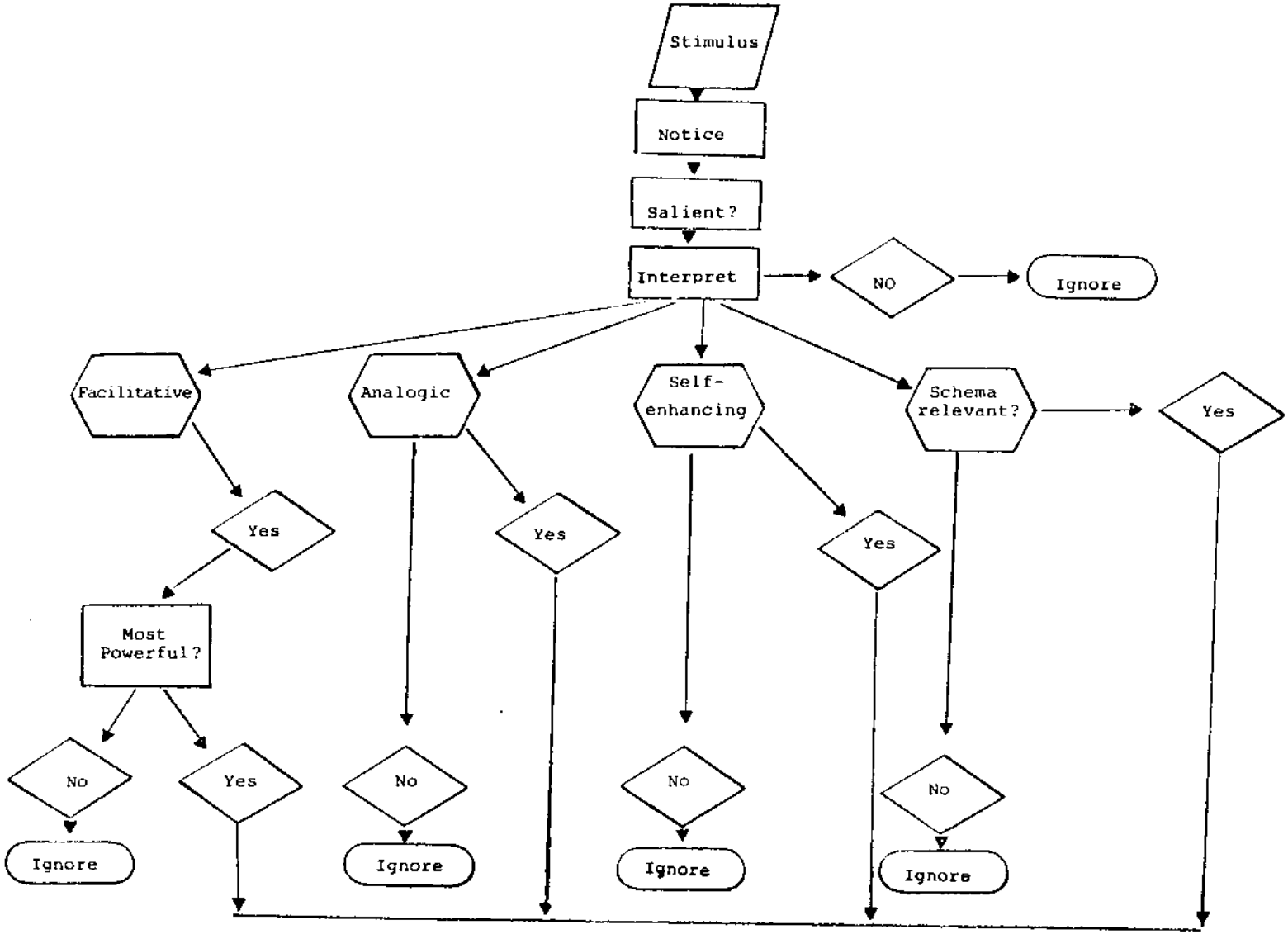

Fig. 4 -- The Cognitive Problem Solving Model

memory and processing capabilities as well as motivation. As a result, they use only a limited amount of information available to them (36).

In terms of problem definition, a difficulty must be recast into a form that can be solved in such a way that it gets us to where we want to be. To find this form, information must be organized in such a way that its regularity and relatedness can be discovered. Managers develop general systems of combining information to make sense of and derive meaning from environmental stimuli. These systems may be developed on the basis of prior experience, exposition, or hypothesis formulation (5).

Prior experience, however can be either helpful or detrimental. According to Bruner (5), the principal giver of instruction is our own past history. Each time new knowledge is acquired, the mind codes it according to the regimen of past experience (7). By virtue of living in a certain kind of professional or social environment, our approach to new experience becomes constrained. If people perceive a series of problems to be related, they will attempt to solve each one with a solution as closely related as possible to a previously correct one. This phenomena increases with the number of previously experienced similar problems (40).

Mott (28) believes that long service in positions of leadership in organizations leads to a ritualizing of methods. In this event, the range of problems considered relevant is

narrowed. Managers may have learned that a certain path exists which will lead to a specific goal. The path to the goal may have been coded only as such, and not in a more generic way that permits the information to be used in other more insightful ways. Such a phenomenon is called selective attention where some sensory input is perceived or remembered better in one situation than in another, according to the desires of the subject (37). In this event, the problem may not be well defined and the development of inappropriate solutions follows.

The manner in which information is coded can be influenced also by the manner in which the individual was instructed to assimilate information. Two methods of assimilation exist: the exposition mode and the hypothetical mode (6). For those instructed in the exposition mode, the instructor plays the part of role model with the student simply following directions. In this mode the need state of the individual will deal in the here and now striving to please the instructor rather than learning the generic significance of what is being learned. As discussed in social cognition, the individual's perception of outcomes desired by others motivate the individual to please rather than to ask critical questions in a search for information revealing the root causes of problems.

For those instructed in the hypothetical mode, a more cooperative relationship exists in that the learner takes an active part in formulating the problem. Here, information can

be gathered either by episodic empiricism or constraint sensitivity. Episodic empiricism, a lack of connectivity and organization, allows the individual to locate the parameters of the problem to help in shaping hypotheses. Constraint sensitivity, on the other hand, attempts to organize information in a mannner that would allow the individual to discover regularities and relatedness. In this case, information drift, allowing the mind to consider various possibilities or related information, is considered useless and time consuming and is, therefore, avoided (6). Training in the hypothetical mode may be desirable for the problem definer who attempts to organize seemingly unrelated information in an attempt to locate the source of a problem.

Creativity

An activity like problem defining appears to be akin to originality and creative thinking where information processing approaches to cognition are used. A mismatch between a mental mode of reality and experiential evidence from the real world spurs the creative problem definer to action. This person spends a great deal of time asking many questions when first approaching a problem. An incubation period occurs as the process shifts from analysis to synthesis. Thus, information processing is less likely to be cut short and the individual is less likely to forget or become confused by the information. Such creative types typically score high on the need for autonomy and aggression (20).

Other creativity researchers have pointed to the distinction between problem finding and problem solving in that there are stages of the creative process above and beyond simply finding solutions to already identified problems. Clark and Miller (8) believe that creative people use their skills to put pieces of information back together in novel ways after analyzing problem essentials. Though problem formulation is extremely important, for many it appears to be a somewhat unfamiliar chore. In testing hypotheses about the effects of creativity training, Basadur encouraged participants to attempt to discover concepts not considered before (3). Participants individually defined a problem from a sample case and then compared definitions with others. In this way, participants discovered that problems could be viewed in many different, yet fruitful ways.

Several articles on the creative process look at the brain as the dominant source of creativity (10, 11). The writings imply that a person is usally either right or left hemisphere dominated with the right brain being much better at non-verbal ideation, intuition, holistic and synthesizing activities and tasks. The left hemisphere is described as being the logical portion of the brain (11). The problem definer is hypothesized to be somewhat creative and prefer ideation and intuition. It seems necessary, therefore, that this person would be right hemisphere dominated. However, no attempt will be made here to make that determination. Rather, the idea is presented as it relates to the notion of cognition.

Summer and White (39) discuss creative techniques which can be used to improve the decision making process. Among the techniques which may be useful in problem definition are brainstorming, synetics, and Gordon or Little techniques. These techniques are often intuitive and exhibit ideation and variety in approaching problem situations. Those who prefer such techniques are perhaps right hemisphere oriented. Other techniques which are perhaps more applicable to problem solving than to problem definition and could be expected to be preferred by left hemisphere oriented individuals are; organized random search, catalogue technique, attribute listing and grid analysis. These techniques can also be related to the information processing methods of episodic empiricism and constraint sensitivity.

There is not a great deal of agreement in the literature that creativity can be taught. However, Meadow and Parnes (22) discovered that training in creative problem solving led to an increase in the quantity and quality of ideas generated. As a result of creativity training, individuals trained by Meadow and Parnes were more confident, aggressive, persistent, persuasive, verbally fluent, and somewhat playful in dealing with their problems. There was a marked increase in dominance and aggressiveness among their trainees. Both dominance and aggressiveness are personal needs characteristics identified by Edwards. It is not known whether the results of creativity training are long lasting. However, creativity research and

training can remove social, mental, or organizational barriers to ideation (3). In rapidly changing organizational environments, creativity or ideation is necessary to solve the complex problems encountered by managers.

According to Howard (12), in tests on individuals of varying ages, creativity scores decreased approximately ninety percent between the ages of five and seven and by age forty, an individual's score has decreased ninety-eight percent. These findings suggest that organizations train creativity and problem defining skills out of their employees. If this is the case, one would expect to find fewer creative types, i.e. those who would exhibit a preference for ideation, among older managers. Given that experience takes time to acquire and managers are often rewarded for their experience (which often translates to tenure in the organization), higher level managers might have fewer problem defining skills than lower level managers. Basadur, Graen, and Green (3) suggest, however, that creativity training can result in significant and measurable positive effects on creativity in the short run. It is unknown whether these are long lasting effects, though.

Summary

The essence of management is problem finding and problem solving as it relates to a desired result or goal. Problem solving has been widely studied and addressed in the literature. Problem definition, on the other hand, has received

only cursory attention, being subsumed in discussions of decision making, problem solving, cognition, information processing, and creativity. Especially as it applies to the field of management, in approaching problems it is assumed that one knows what the problem is.

Several definitions of problem solving were found in the literature with common elements of desired states, actual states, individual goals, and group goals emphasized. In sum, a problem is usually defined in terms of the accomplishment of some goal or at least closing the gap between the actual and desired state within organizations.

Though called by various authors problem sensing, problem formulation, problem solving, problem finding, or problem identification, this process was seen as a necessary precondition for effective decision making. At this point in the study of problem definition, research shows that managers have difficulty being explicit about their problem defining methods or techniques. Several authors have emphasized the need for problem defining skills and suggest that problem definition, problem solving and problem implementation are sequentially needed to effectively close the gap between an actual and a desired state.

Cognition, creativity, and information processing play an important role in the definition of problems. Cognitive processes work in such a manner as to make certain kinds of problem sensing behavior more likely to occur. Information

processing, social perception, motivation, as well as creative ability serve as mediating variables that enhance or inhibit the process of defining problems. Research on psychological types, levels of intuition, left and right-brain domination and past and present social cognition give some support to the thesis that problem defining skills can be identified and nurtured in individuals and organizations. However, this skill is not commonly taught in institutions of higher learning nor reinforced by organizations. To teach this skill to students, whether in educational institutions or other organizations, the process must be understood.

This research focuses on determining how information processing, cognition, and learning take place in problem definers. As a starting place, a problem definer is likely to be more creative and exhibit a preference for ideation. Additionally, this person may choose to forego more traditional models for defining differences between actual and desired states choosing to focus on episodic empiricism or constraint sensitivity instead. Modes of cognition are likely to be more intuitive, or right brain dominated. Some motivation, whether intrinsic or organizationally induced, also seems to influence the process.

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Chapter III

METHODOLOGY

Participants and Procedures

Managers are charged with problem solving responsibility in organizations. In classic problem solving fashion, they must identify problems, develop alternatives for problem solution, and implement chosen alternatives. In organizations, non-managerial individuals often assist in the problem solving process. However, these individuals may lack authority to make decisions or implement solutions. For this reason, managers were chosen as research subjects for this study.

Organizational researchers have employed cultural concepts to analyze various aspects of organizational behavior (8). Decision making and other behaviors are related to the ideologies and values held by managers and other members of organizations (3, 4, 7). These ideologies and values combine to form an organizational environment, a corporate culture, which affects how individuals in that environment will react to stimuli. While elements of culture may relate to functional problems as they arise and are interpreted in organizations, this study looks at the individual who must conceptualize and define problems. In an effort to guard against cultural,

organizational bias, then, four diverse firms were selected for this study (see Appendix A for details).

A total of eighty-two managers from first line supervisors to top level executives took part in this study. Of those, only seventy-seven could be used for the final analysis because of incomplete instruments in five cases. The chief executive of each firm encouraged his managers to participate on a voluntary basis and provided on-site facilities for testing. Each individual received a package of test materials which were self-administered under the supervision of the researcher. Most participants were able to complete all tests within a two hour time period.

Group Variable: Problem Solving Type

Each individual has a combination of experiencing, ideating, thinking, and evaluating orientations. These orientations reveal the extent to which an individual approaches problems through direct personal involvement, generation of ideas without judgment, detached abstract theorizing, or the application of judgment to ideas. Problem definers were identified using the Basadur Simplex wherein four unique problem solving types are identified.

These four problem solving types include:

The Fact Finder: Type I	One who gets involved, gathers information, asks questions, imagines possibilities, and views situations from different perspectives. The fact finder is imaginative and emotional.

The Problem Definer: Type II	One who approaches problems by abstract thinking and ideation and can put ideas together. This person can distill disparate observations into integrated explanations and is concerned more with understanding than decision making.
The Planner: Type III	One whose dominant strength lies in turning abstract ideas into practical solutions and plans. The planner is relatively unemotional, preferring to deal with things rather than people and is able to make sound, logical evaluations to select optimal solutions. Planners are somewhat impatient with additional points of view or possible relationships.
The Implementer: Type IV	One who prefers to get things done by carrying out plans and making things work. Complete understanding is not necessary and these people will follow through to make sure their solution is accepted.

Basadur believes no single type of problem solving is necessarily more desirable than another. However, knowledge of how an individual approaches problems can be gained through this typology. Of the seventy-seven research subjects studied, fourteen were fact finders, twelve were problem definers, twenty-two were planners and twenty-nine were implementers. As described by Basadur, the problem definer desires thorough understanding and forms relationships, associations, and insights, in order to define problems and conceptualize new ideas and opportunities. Inductive reasoning is used to arrive at integrated explanations for the myriad symptoms which often accompany problems.

Discriminating Variables

Demographic Information

Having tentatively identified a problem definer using the Basadur Simplex, the next step involves determining how these individuals differ from others who must deal with problems. Selected for use in the analysis were fifteen items asked of all participants. These items concerned participants' (1) demographic information such as age, sex, and marital status; (2) educational background; and (3) work environment and history. A personal data questionnaire was used to gather this information. A copy of the questionnaire can be found in Appendix B.

The majority of the managers participating in this study were between thirty and forty years of age. Of these managers, fifty-seven were male and twenty were female. Almost all were caucasian and married. As shown in Table I, almost half held middle management positions.

Educational characteristics of these managers varied. While forty of the managers studied had business degrees, only five of the problem definers had formal business education. All were college educated, however. Problem definers were found at all levels of management. However, three of them were in specialized positions requiring high technical skill. A breakdown of the educational backgrounds, levels of management and problem solving type can be seen in Table II.

TABLE I

TABLE OF PROBLEM SOLVING TYPE BY LEVEL OF MANAGEMENT

Problem Solving Type	Level of Management				
	First Line Supervisor	Lower Mgmt.	Middle Mgmt.	Upper Mgmt.	Other
Fact Finder	3	3	5	3	
Problem Definer	1	2	2	4	3
Planner	2	5	8	4	3
Implementer	2	3	19	2	4
Total	8	13	34	13	8

Most managers in this study had at least ten years experience in solving problems with ninety-four percent indicating that they often played the role of detective when dealing with perceived problems. Respondents were asked to indicate which of Pounds' four models they used in becoming aware of problems. As can be seen in Table III, the extra-organizational model was the most commonly used. Aware of how other organizations approached various situations, thirty-one percent of these managers emulated what they perceived as being successful or desirable elsewhere. Twenty-seven percent used other people's models to identify their problems. Here, customers, competitors or others within the organization defined the problem. In this case, the manager is likely to be responsible for solving the problem, that is implementing a predetermined solution, rather than defining it.

TABLE II

EDUCATIONAL CHARACTERISTICS OF RESPONDENTS

	Level of Education					
Level of * Management	Some High School	High School	Some College	Bachelor Degree	Master Degree	Other
First Line Supervisor (1)			3	4		1
Lower Management (2)	1	3	1	6		3
Mid-Management (2)			10	17	5	2
Upper Management (4)			3	7	2	1
Other (3)				5	1	2

*The number of problem definers in each category is indicated in parentheses.

	Level of Education by Problem Solving Type				
Fact Finder		2	4	6	2	
Problem Definer			1	10		
Planner			5	8	1	6
Implementer	1		7	14	6	3

Problem Solving Type	Field of Education				
	Business	Engineering	Economics	Science	Other
Idea Finder	6	1			7
Problem Definer	5		1	2	4
Planner	10		1	4	5
Implementer	19	1	1	2	9

TABLE III

FREQUENCY OF MODEL USED

Model *	Frequency		Percent	
Planning	(1)	16	(8)	20.8
Historical	(1)	12	(8)	15.8
Other People's Model	(3)	21	(25)	27.3
Extra-organizational	(6)	24	(50)	31.2
Other	(1)	3	(8)	3.9

*Numbers in parentheses indicate frequency and percent of problem definers using each model.

The planning model was used by nearly twenty-one percent of the managers studied. Such managers recognized a problem by virtue of the fact that a plan was not proceeding as prescribed. Another sixteen percent of these managers used the historical model to identify their problems. In this case, it was perceived that things were not progressing as in the past. Some deviation from past performance occurred which evoked a need for attention and response.

Cognitive Style and Preference for Ideation

In addition to the items discussed thus far, two other discriminating variables were included in the analysis, cognitive style and the preference for ideation. To determine cognitive style, the Myers Briggs Type Indicator was used. This indicator ascertains an individual's basic preference for

perception or judgment (JP), extraversion or introversion (EI), sensing or intuition (SN), and thinking or feeling (TF). The indicator is based on Jung's theory of type which states that variation in human behavior is ordered and consistent and that individual personality is a combination of the four basic preferences (7, p. 1). Forced choice statements are used which point to preferences reflecting habitual choices between opposites. Preference scores are indicators of the direction of the preference for each individual on the basis of four indices discussed previously: EI, SN, TF, and JP.

In identifying common characteristics of problem definers, it is expected that a person may reasonably develop several preferred cognitive skills. The problem definer would be adept at dealing with ideas and concepts and tend to be perceptive. In becoming aware of problem areas, the problem definer is hypothesized to rely on indirect perception that is, intuition, to gain insight into specific problem areas. In addition, the problem definer is expected to exhibit a preference for thinking, dealing somewhat impersonally with facts to determine their influence in any given problem area. This type tends to be adult in thinking judgment and might even be considered somewhat insensitive to people. The problem definer, then, is hypothesized to have an INTP Cognitive Style, i.e. an introverted, intuitive, perceptive thinker. In this study, sixty-two of the managers exhibited thinking styles choosing to approach problems through logic

and impersonal findings while concentrating on whether ideas were true or false. Such individuals tend to be extremely adept in the organization of facts and ideas. Only sixteen managers were feeling types who concentrate on valued or not valued. Additionally, there were approximately equal numbers of introverts and extraverts with thirty-six introverts and forty-one extraverts.

Thirty-eight of the managers studied were sensing types while twenty-nine were intuitive types. Those who prefer sensing are more interested in actualities than in speculation. Those who prefer intuition are more interested in all the possibilities that occur to them. More of these managers, then, preferred to pay attention to a stream of facts rather than to impressions or ideas. In addition, sixty-one of the participant managers exhibited judging preferences while only sixteen could be considered to have perceptive preferences. (See Table IV for a summary of these findings.)

A final discriminating variable is the preference for ideation. Ideation is the generation of ideas without evaluation. Evaluation is defined as the application of judgment to ideas generated. During ideation, non-judgmental, imaginative, divergent thinking is prevalent. The imagination is free to facilitate the discovery of problems (2). The ideation process allows options to proliferate without regard to judgment or rules of logic. This thinking process allows the problem definer to entertain entirely new and sometimes unconventional ideas when defining problems.

TABLE IV

TYPE TABLE OF MANAGERS

PERCEIVING FUNCTION		CONCLUSION FUNCTION			
		INTROVERTS		EXTRAVERTS	
		Judging	Perceiving	Judging	Perceiving
INTUITIVE	Thinking	4	5	3	11
	Feeling	2	1	1	2
SENSING	Feeling	3	1	1	4
	Thinking	18	2	2	17

The cognitive preference for intuition can be used as a measure of the preference for ideation in that the intuitive type would use indirect perception in a non-judgmental manner when approaching problems. However, to enhance the validity of this measure of ideation, the Basadur-Finkbeiner Preference for Ideation scale was used. This scale is composed of attitudinal items which measure a preference either for ideation

or for evaluation. Scale scores for each participant were used to identify individual preferences.

Twenty-six managers were classified as preferring ideation while fifty-one preferred evaluation. The distribution of these preferences among problem solving types is shown in Figure 5. Among fact finders, four preferred ideation while nine preferred evaluation. Among problem definers, two preferred ideation while nine preferred evaluation. Implementers showed a similar preference for evaluation with twenty evaluaters and eleven ideaters. Among all managers studied, a full sixty-six percent preferred evaluation to ideation.

The problem definers identified in this study were more comfortable using evaluation, a judging preference, to come to conclusions about what is perceived. Certainly this is consistent with the frequencies found using the Myers Briggs Type Indicator which also showed problem definers as judging types. However, it is still necessary to determine whether a relationship exists between problem solving type and the preference for ideation. A Chi Square test was used to determine whether the preference for ideation was related to problem solving type.

Discriminant Analysis

In searching among the variables discussed thus far for unique attributes of problem definers, multiple discriminant analysis was undertaken. Eighteen variables were originally considered. These included: age, sex, race, level of

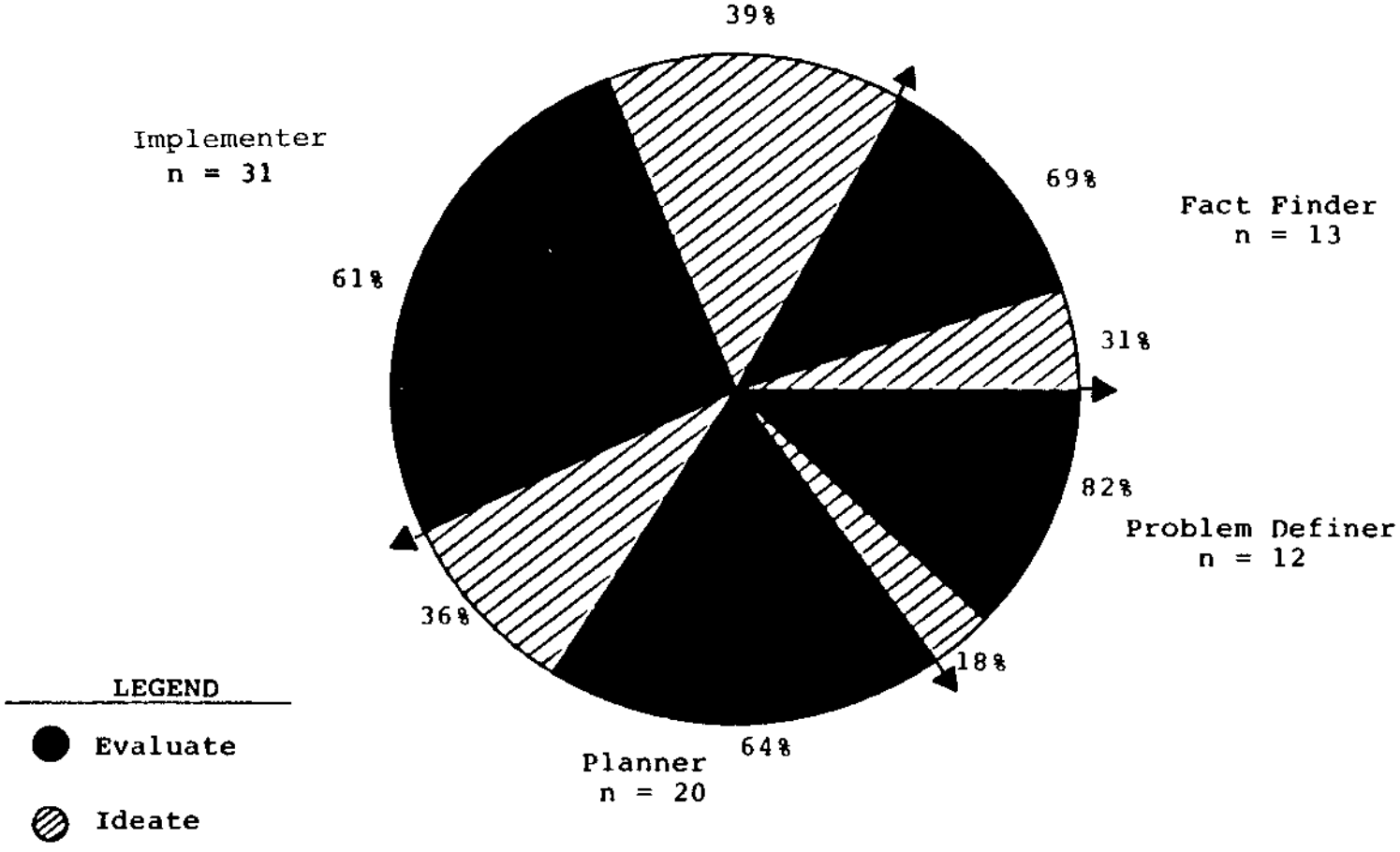

Fig. 5--Preference for Ideation and Problem Solving Style

education, type of education, experience at problem solving, level of management, models used, marital status, organization, industry, thinking/feeling, sensing/intuiting, judging/perceiving, extraversion/introversion, and preference for ideation. Of these, only five survived the stepwise discriminant procedure: organization, level of management level of education, extraversion/introversion, and sensing/intuiting. Discriminant analysis was chosen because of nominal dependent variables. The nature of the statistical problem involves developing a rule or discriminant function, based on the measurements obtained from each individual in the sample. This rule allows a new individual to be assigned to the correct population when it is not known from which population that individual came. The underlying motive is to provide maximal discrimination between populations. Once the linear discriminant function is established, each individual in the sample is classified into one of the four groups on the basis of the function. The classification rate serves as a measure of the goodness of the decision rule (6, pp. 414-434).

For this study, stepwise discriminant analysis procedures were used because relationships between the discriminant variables and the group variable were unknown. One variable was included in the discriminant function at each step, the variable with the most significant F value after adjusting for variables already included in the model. The step-by-step procedure continues until no further significant gain in

discrimination can be achieved. The Statistical Package for the Social Sciences (SPSS-X) discriminant analysis procedure was used for this analysis. Discriminant variables were entered stepwise using the Mahalanobis distance criterion. Normal distribution probability specification was used during classification.

"Insight" Variables

Personal Needs Characteristics

To enhance the validity of several of the discriminating variables discussed thus far, one further instrument was used in this study, The Edwards Personal Preference Schedule (EPPS). This instrument identifies unique personal needs among problem definers (5). Certain of these needs, if predominant in problem definers, would lend credence to the INTP profile hypothesized earlier. The EPPS provides a measure of fifteen relatively independent normal personality variables.*

These variables are

Achievement (ach)
Deference (def)
Exhibition (exh)
Order (ord)
Autonomy (aut)
Affiliation (aff)
Intraception (int)
Aggression (agg)
Succorance (suc)
Dominance (dom)
Abasement (aba)
Nurturance (nur)
Change (chg)
Endurance (end)
Heterosexuality (het)

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* A complete description of these personal needs characteristics as defined by Edwards can be found in Appendix C.

It was hypothesized that problem definers would differ from non-problem definers on the needs for autonomy, change, endurance, and intraception. These needs characteristics would be consistent with the INTP profile hypothesized earlier. A high need for autonomy indicates a person prefers to be independent of others when making decisions, likes the unconventional and prefers to say what he or she thinks. In problem definition, this person would likely entertain new ideas in searching for the meaning of deviations from the desired or expected goals.

A high need for change would indicate a desire to experiment and try new things. This need for change would likely prevent the problem definer from experiencing fixation. That is, when a new problem presents itself, this person would consider it a new challenge to be explored. This perspective prevents circumvention of full problem definition in that the problem definer would look for all possible meanings before proceeding to the problem solution stage rather than equating this problem to a previous problem that may have had similar effects yet dissimilar causes.

A high need for endurance among problem definers would indicate that these individuals work hard at understanding problems. These individuals would stick at a problem even though it would seem that no progress was being made toward solution. Judgment would tend to be deferred until a thorough investigation of the problem was undertaken. Deferring such judgment would prevent premature implementation of alterna-

tives designed to alleviate symptoms that might fall short of curing causal ills.

The need for intraception in problem definers would indicate that such a person analyzes feelings and motives in understanding problems. This person would observe others to understand how they feel about things. Such observations can enhance the development of a thorough understanding of a problem. This need would also reinforce the introverted cognitive style hypothesized as being characteristic of problem definers.

Problem Definition Exercise

In a further attempt to understand how problem definers approach problem situations, a problem scenario was developed. The problem secenario was devised so the the "problem" seemed obvious. That is, all subjects would be able to understand the nature of the predicament. How they chose to define that predicament would vary, however. Each subject was instructed to list all of the ways in which the problem scenario could be defined. From among those listed, the subject was asked to select that definition which best defined the problem. The problem scenario was presented as follows:

> Two travelers were driving a medium sized rental car down a desolate stretch of highway. They were about ten miles from a gasoline station they had passed earlier. The only thing they had seen since passing the station was a deserted barn a mile or so back. They had not seen a single car on this stretch of road since starting out. The next town was approximately ten miles ahead. Suddenly, the rear tire of the car blew out. The travelers managed to pull the car off to the side

> of the road and stop without difficulty. They opened the trunk of the car, pulled out the spare tire, and discovered there was no jack in the car.

The responses elicited from participants fell generally into four categories; regrets, facts, puzzlement, and solution. In the regrets category, responses included all the things that should have been done to prevent the situation from arising. Examples of these responses are:

> "The rental agency should have checked to see that the car was properly equipped."
>
> "The driver should have checked all tires before departure."
>
> "The rental agent should not have rented out an improperly equipped vehicle."
>
> "The travelers should have planned better."
>
> "The travelers should have looked at a map of the area they would travel."

In the facts category, respondents merely restated the facts of the case. In this approach, the problem was perceived as self evident. No attempt at definition actually took place and no solutions were offered. Problem definitions in this category included:

> "Two travelers are stranded."
>
> "The travelers have a flat tire and no jack."
>
> "They are ten miles from the nearest town."
>
> "There is no gas station within ten miles."

Responses in the puzzlement category concentrated on how to resolve issues in search for solutions or how decisions should be made. Respondents seemed unwilling to commit to a solu-

tion, yet each query implied some predetermined solution. It seems that consensus, or at least approval, was required before a course of action could be considered by these problem solvers. Responses from individuals in this category included such statements as

> "How do we fix the flat?"
>
> "How can we get to a phone and call the rental agency."
>
> "How can we decide which direction to go in?"
>
> "How can we decide who will go for help?"
>
> "How can we get to the next town?"
>
> "How can we get help?"

The final category of responses can be called the solutions category. While the puzzlement category implies various solutions, concentration is focused on how the decisions would be made rather than what solutions could be selected. In the solutions category, the respondents offered various ways of solving their problem. Here it was assumed that the problem was self-evident, the individual merely had to follow the prescribed course of action, and the problem would be solved. Examples of responses in this category included such statements as

> "I would try blocking up the car with rocks."
>
> "If the travelers were female, they should raise the hood and wait."
>
> "The travelers should walk back to the gas station."
>
> "They could drive on the flat--it beats walking."

"One person stays with the car while the other walks to the next town."

"They could go to the barn and find something to use in the barn."

Given the fact that four categories of approaches evolved in regard to the problem scenario, a relationship between problem solving style and the approach an individual might take in dealing with the problem seems likely. Such a relationship might indicate that cognitive style influences problem definition. A chi square test for independence was used to test for such a relationship.

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Chapter IV

ANALYSES AND FINDINGS

Group Variable: Problem Solving Type

Among the four problem defining profiles identified in this study, the smallest group was that of problem definers. Only twelve, or 15.6 percent, of the seventy-seven research subjects fell into this category. Such a small number limits any generalizations which can be made about these individuals. However, as with all exploratory research, direction for further research can be indicated.

To some extent, the fact that only twelve of the managers studied were problem definers is a finding in itself. Such small numbers might be attributed to (1) a lack of problem defining skills being taught in educational programs; (2) the lack of promotional opportunities for problem definers; (3) the failure of business to attract individuals with problem defining skills; (4) the failure of business to recognize and/or reward problem defining among managers; or (5) an unrepresentative sample of managers in this study.

Livingston (7) has pointed out that little attention is given in formal educational programs to the development of problem defining skills. Basadur, Graen and Green (2) refer

to it as a somewhat unfamiliar chore. Such unfamiliarity may be due to the emphasis on the exposition rather than the hypothetical mode being used in many education situations. Especially in schools of business where large numbers of managers are trained, students are often told how to proceed in "solving" their problems in step by step expository fashion.* A typical example is the rational problem solving process. Students are told to rationally and sequentially approach their problems as follows:

1. State the Problem
2. Develop Alternatives
3. Evaluate Alternatives
4. Choose and Implement the Best Decision
5. Evaluate the Decision

Management education further stipulates that managers must have the ability to obtain solutions to problems that occur in their areas of responsibility. Implicit in this stipulation is the idea that if an individual has this ability, success naturally follows. The ability to obtain solutions hinges on deciding which alternative is "best". Students believe, perhaps mistakenly, that the decision is tantamount--action must be taken quickly for one does not wish to be considered indecisive and/or ineffective.

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*Introductory Management texts all describe this process in essentially the same manner. Some call it the decision-making process while others refer to it as the problem-solving process. Still others call it the planning process.

If one assumes such a decision oriented perspective, this focus may be exacerbated especially if promotion to management rank requires a formal degree. Those who would be selected for management positions would have been thoroughly trained to follow the formal problem solving process. They would not investigate, question, nor desire a thorough understanding of the problem before proceeding toward solution. The focus would be on achieving results. Any result will do as long as others perceive that action is being taken. Action implies results, though not necessarily solution. If the problem is not solved because the action is inappropriate to the problem, there is no harm done. Other effects of this problem can simply be called a different problem. What is identified as the problem is simply an explanation of the problem's existance rather than real understanding of causal relationships.

Another explanation for the lack of problem definers could be that a manager's attention, and perhaps even rewards, are focused on action rather than results. Of the managers studied here, 28.6 percent were planners and 37.7 percent were implementers. A full two-thirds then, were action oriented. Both implementers and planners operate best when evaluating and selecting among alternatives. They do well in gaining the acceptance necessary to facilitate implementation of alternatives. Since the focus is on getting things done, full problem definition is avoided yet it is problem definition that determines what alternatives are proffered. A complete

mental testing of ideas is considered time consuming and wasteful. After all, the ambitious manager desires promotional opportunities and must "make his mark" now! Understanding is not necessary for problem solution to proceed. Where theory does not fit the facts, it will likly be discarded. In Simon's terminology, these are true satisficers.

The problem definer, on the other hand, is able to view situations from different perspectives. The problem definer does not want to proceed until he or she has a sound understanding of the situation and the problem is well defined. This person would be viewed as a slow, unrealistic dreamer. Every new piece of information is potentially revealing. These types are not action oriented. Rather, they are good at generating options and/or explanations but are less concerned with decision making and implementation. If an organization focuses on action and selects only action oriented individuals to promote to management ranks, problem definers would be overlooked. Short term actions would be rewarded at the expense of long term, time-consuming, but effective solutions.

The lack of problem definers may arise because these theoretical types are not drawn to business organizations in the first place. Being more concerned with sound understanding, these individuals see relevance in almost everything and are not comfortable in environments which disdain too much dreaming about additional ideas. These individuals would

choose to follow career paths allowing more creative, thought provoking activities such as scientific research or philosophical endeavors. They may even be the entrepreneurs among us. Being logical and analytic, they probably avoid the more free spirited occupations found in theater, music or art.

Finally, the lack of problem definers may simply be a chance occurrence. The sample of problem solving types that emerged in this study may not be representative of the population of problem solving types. One thing can be concluded, however. To enhance problem definition, organizations must seek to recruit and/or nurture those individuals who exhibit a talent or need to understand problems. Additionally, these problem definers must be rewarded as contributing significantly to the organization's problem solving ability.

Discriminating Variables

Cognitive Style

To discover the relationship between cognitive style and problem definers, the different problem solving types identified by the Basadur Simplex were compared by cognitive style. As can be seen in Table V, fifty-one of the managers studied were implementers or planners. These individuals largely prefer sensing for the purpose of perception and thinking for the purpose of judgment, using impersonal analysis to focus on facts which can be directly collected and verified. They are practical and matter-of-fact. Because these types are also

overwhelmingly judging types, they tend to shut off possibilities having already decided to agree or disagree with specific conclusions.

TABLE V

COGNITIVE STYLE AND PROBLEM SOLVING TYPE

Problem Solving Type	Cognitive Style	
Fact Finder n=14	Intuitive 7 Introverts 3 Perceptive 4 Feeling 4	Sensing 7 Extraverts 11 Judging 10 Thinking 10
Problem Definer n=12	Intuitive 6 Introverts 6 Perceptive 2 Feeling 3	Sensing 6 Extraverts 6 Judging 10 Thinking 9
Planner n=22	Intuitive 10 Introverts 16 Perceptive 5 Feeling 2	Sensing 12 Extraverts 6 Judging 17 Thinking 20
Implementer n=29	Intuitive 6 Introvert 11 Perceptive 5 Feeling 6	Sensing 23 Extravert 18 Judging 24 Thinking 23

A smaller number of managers studied could be considered fact finders and problem definers. Among the twelve problem definers studied, ten preferred judging to perception and nine preferred thinking to feeling. There were an equal number of intuitive and sensing types as well as introverts and extra-

verts. While problem definers exhibited thinking rather than feeling styles, they were neither intuitive nor introverted. Additionally, they exhibited judging rather than perceiving styles.

In general, in comparing problem solving types to cognitive styles one can say that the majority of the managers studied tended to be planning and implementation oriented. Thinking and judging were used almost exclusively by managers regardless of problem solving type. Perceptive types were noticeably lacking as were feeling types. The fact finder and the problem definer have common cognitive styles with fact finders being somewhat more extraverted than problem definers. Problem definers were not overwhelming intuitive nor introverted. The largest portion of them were judging types rather than intutive types. The majority were also thinking types rather than feeling types. The INTP profile did not surface.

The problem definers' strength lies in the ability to assimilate information and develop causal explanations for problems. The thinking style indicates a theoretical bent; the judging style indicates an economic interest. Individuals must learn to survive in organizations regardless of their personal styles, however. This survival motive can be used to explain the fifty/fifty split on extraversion and introversion. Some problem definers, who do their best work inside their heads, learn to deal ably with the world around them when necessary.

The intuitive sensing split may reflect technical-scientific interests combined with economic-political interests. Here again the survival motive forces these individuals to deal in ideas that can be easily understood by others. The problem definer may be most interested in the technical-scientific aspects of problems. However, the bills must be paid and research must be funded. This person, then, becomes politically adept at protecting his or her economic well-being.

Preference for Ideation

Table VI summarizes the ideation/evaluation preferences of the research sample. At first glance, it appears that managers preferred evaluation to ideation. However, to determine whether the preference for ideation is related to problem solving type, a Chi Square Test for Independence was performed. The hypotheses were stated as follows.

H_o = The preference for ideation is independent of problem solving type.

H_a = The preference for ideation is dependent on problem solving type.

Due to the small expected value in two cells of the contingency table, non-parametric procedures were used in this analysis. As a result, there is the inherent disadvantage of this being a low powered statistical method with a greater risk of Type II error (4, pp. 617-619). With a calculated Chi square value of 1.92, it is not possible to show a statistical rela-

TABLE VI
CONTINGENCY TABLE OF PROBLEM SOLVING TYPES AND PREFERENCE FOR IDEATION AND EVALUATION

Problem Solving Type	Preference for Ideation*	Preference for Evaluation*	Total
Fact Finder	(4) 4	(9) 9	13
Problem Definer	(2) 4	(9) 7	11
Planner	(8) 7	(14) 15	22
Implementer	(12) 11	(19) 20	31
Total	26	51	77

*Observed Values are shown in parentheses ( ).

ideation at the .05 level of significance. Complete Chi Square calculations can be found in Appendix D.

The preference for evaluation reinforces the judging, thinking cognitive style found among problem definers. Judgment determines what an individual decides to do about a given situation. Combined with the logical, analytic thinking process, the problem definer takes a practical approach to problem solving. However, those who are also intuitive thinkers would be intellectually more ingenious in approaching their problems. The survival instinct may relegate this intuitiveness to auxiliary status in problem definers because the organization deals in actualities rather than possibilities.

The organizational culture can either enhance or suppress this type of thinking.

Insight Variables

Edwards Personal Preference Schedule

The Edwards Personal Preference Schedule was used to identify unique personal needs among problem definers. This instrument provides a measure of fifteen relatively independent normal personality variables. It was hypothesized that problem definers would differ from non-problem definers on some of these variables. To determine how this group differed, means and standard deviations for each group were calculated and are presented in Table VII. A cursory glance at the table indicates that fact finders may have a low need for order and a high need for intraception. Problem definers, on the other hand, appear to have a low need for deference and a higher need for succorance. A low need for affiliation and nurturance with higher needs for endurance and heterosexualtiy might be characteristic of planners. Implementers also seem to exhibit a low need for nurturance.

To test for significant differences among the problem solving groups, student's t scores were used. T scores were selected due to the small sample size of the groups (7, 158-171). The general hypotheses statements tested involving the EPPS personal needs characteristics can be stated as:

$$H_o : \quad m_d = m_1 - m_2 = 0$$

$$H_a : \quad m_d = m_1 - m_2 > 0$$

TABLE VII

MEANS AND STANDARD DEVIATIONS FOR PERSONAL NEEDS CHARACTERISTICS

Need	I Fact Finders m	s	II Problem Definers m	s	III Planners m	s	IV Implementers m	s
ach	19.31	2.02	18.75	3.65	19.32	4.40	18.62	4.19
def	12.62	3.18	11.08	3.55	13.73	3.71	13.10	3.29
ord	10.69	4.64	12.75	5.15	13.95	4.13	12.79	5.56
exh	14.46	3.38	13.67	3.87	14.05	4.16	14.31	3.92
aut	13.62	4.91	12.33	4.19	12.55	4.45	12.59	4.31
aff	14.08	3.25	15.08	4.40	12.23	5.06	13.52	4.38
int	17.38	4.63	15.67	4.10	15.68	5.29	16.28	3.83
suc	9.54	4.58	12.08	5.26	9.73	4.06	12.07	4.42
dom	19.85	4.85	18.33	4.31	18.55	5.67	19.97	3.58
aba	11.92	4.29	10.67	4.77	10.09	5.89	10.10	4.32
nur	14.69	4.23	14.41	2.27	11.55	5.37	12.52	5.09
chg	15.38	3.73	15.50	4.42	15.41	4.99	14.45	4.73
end	14.31	5.57	15.08	5.09	16.00	5.42	14.79	4.56
het	11.85	4.06	12.17	4.24	16.14	6.92	14.83	4.71
agg	11.23	4.04	12.42	4.29	11.05	3.88	11.59	4.61
	n = 13		n = 12		n = 22		n = 29	

The results of the hypotheses testing are presented in Table VIII. In general, it was found that planners and implementers had significantly higher needs for deference than

implementers had significantly higher needs for deference than either the fact finders or the problem definers. Planners exhibited significantly higher needs for order than any of the other problem solving types. Problem definers had significantly higher needs for affiliation than planners or implementers. Fact finders and problem definers had significantly greater needs for nurturance than planners. Additionally, planners had significantly higher needs for heterosexuality than fact finders or problem definers. No significant differences were found on the needs for intraception, succorance, or endurance among groups.

These results indicate a particular suitability for the role each problem solving type plays in an organization. The planner, who turns abstract ideas into practical solutions, prefers to deal with things rather than people. These types tend to believe they know what the problem is and focus on optimizing action plans. A high need for deference indicates this person follows instructions and does what is expected. Others make suggestions as to problem definition or decide what the problem is. The need for order indicates that this person accepts leadership for organizing a proposed plan of action. The planner wants things to run smoothly without change. Therefore, this person avoids the unconventional when dealing with problems. Additional ideas or points of view are disliked as they introduce the element of change.

TABLE VIII

HYPOTHESIS TESTING OF SAMPLE MEANS

Need	Hypotheses*	DF	t value	Difference	Result**
Def	I>II	23	2.31	1.54	FTR H
	IV>II	39	2.00	2.02	Reject H
	III>II	32	2.20	2.65	Reject H
Ord	II>I	23	3.36	2.06	FTR H
	III>I	33	2.65	3.26	Reject H
	IV>I	40	2.77	2.10	FTR H
Het	III>I	33	3.16	4.29	Reject H
	III>II	32	3.26	3.97	Reject H
	III>IV	49	2.88	1.31	FTR H
	IV>II	39	2.52	2.66	Reject H
End	III>I	33	3.28	1.69	FTR H
	III>II	32	3.18	.92	FTR H
	III>IV	49	2.40	1.21	FTR H
Nur	I>III	33	2.79	3.19	Reject H
	I>IV	40	3.81	2.17	FTR H
	II>III	32	2.24	2.87	Reject H
	II>IV	39	1.93	1.90	FTR H
Suc	II>IV	39	2.90	1.91	FTR H
	II>III	32	2.97	2.35	FTR H
	II>I	23	3.38	2.54	FTR H
Int	I>II	23	2.99	1.71	FTR H
	I>III	33	2.91	1.70	FTR H
	I>IV	40	2.50	1.10	FTR H
Aff	II>III	32	2.83	2.85	Reject H
	II>I	23	2.66	1.00	FTR H
	II>IV	39	3.82	1.56	FTR H

* Roman numerals denote problem solving type.
** FTR denotes Failure to reject the Null Hypotheses.

necessary to ensure that new procedures are successful and may, consequently, be perceived as being pushy types. Basi-

necessary to ensure that new procedures are successful and may, consequently, be perceived as being pushy types. Basically, these individuals take suggestions from others, follow directions and get people to conform. Here again the unconventional is avoided with someone else suggesting what the problem is; the emphasis is on carrying out the plan.

Fact finders, having a high need for nurturance, are kind, sympathetic, and easily gain the confidence of others. They are good information gatherers as a result. They are eager to assist others and revel in ambiguity. They are good at generating options also. Problem defining must begin by gathering information, questioning, and imagining possibilities. Such a process requires a questioning stance. If those being questioned feel no threat from the questioner, they are more likely to share information. The fact finder, then, exhibits a non-threatening problem solving profile which faciliates information gathering.

The problem definer also exhibits characteristics that enhance his or her capability. This person has a high need for affiliation and is good at sharing things with others. Perceived as loyal and friendly, the problem definer forms quick relationships which aid in gaining insight into problems. This person conceptualizes new ideas and strives for integrated explanations of problems. Because of their strong friendship attachments, problem definers are likely not to be good at implementation. They are sensitive to the feelings of

In general, then, each problem solving type exhibits strength in one particular area of problem solving. Planners and implementers are results oriented, focusing on taking an idea and turning it into a reality. Cognitively, fact finders and implementers were more extraverted, or people oriented. This style enhances their abilities to ask non-threatening questions or gain the acceptance of others in implementing new ideas or solutions. The problem definers and fact finders, on the other hand, tend to avoid moving to action while enjoying ambiguity and disorganization. Problem definers specifically enjoy participating in friendly groups and sharing ideas. Not being overly concerned with moving to action, this person is sensitive to people and appreciates ideas. For a thorough understanding of problems, such sensitivity may be desirable.

To further enhance our understanding of problem definers, their EPPS needs were compared to the normative means of the general adult popultion. Table IX reveals that the entire sample of managers tested here are characterized by higher needs for achievement, exhibition, intraception, dominance, and heterosexuality than the general adult population as a whole. Also, the managers studied here seem to exhibit lower needs for deference, order, affiliation, abasement, and nurturance than the general adult population. Significance testing was not undertaken, however.

In analyzing these findings, several conclusions can be drawn. Among managers there appears to be a high need to be

TABLE IX

MEANS OF EPPS VARIABLES FOR NORMATIVE SAMPLE, RESEARCH SAMPLE AND PROBLEM SOLVING TYPES

Variable	General Adult Sample	Type I	Type I	Type III	Type IV	Total Sample
Achievement	14.19	19.31	18.75	19.32	18.62	18.96
Deference	14.46	12.62	11.08	13.73	13.10	12.88
Order	15.14	10.69	12.75	13.95	12.79	12.97
Exhibition	12.12	14.46	13.67	14.05	14.31	14.16
Autonomy	13.06	13.62	12.33	12.55	12.59	12.71
Affiliation	16.14	14.08	15.08	12.23	13.52	13.49
Intraception	14.73	17.38	15.67	15.68	16.28	16.20
Succorance	11.82	9.54	12.08	9.73	10.07	10.20
Dominance	12.37	19.85	18.33	18.55	19.97	19.28
Abasement	15.74	11.92	10.67	10.09	10.10	10.34
Nurturance	17.08	14.69	14.42	11.55	12.52	12.91
Change	14.93	15.38	15.50	15.41	14.45	15.05
Endurance	16.74	14.31	15.08	16.00	14.79	15.11
Heterosex.	9.67	11.85	12.17	16.14	14.83	14.28
Aggression	11.61	11.23	12.42	11.05	11.59	11.38
	n=8963	n=13	n=12	n=22	n=29	n=76

successful, to be the center of attention, to analyze the behavior and motives of others, to supervise and direct the action of others, and to be regarded as physically attractive to members of the opposite sex. Given the responsibilities and/or norms and expectations of managers in the workplace, these needs may either be considered necessary for the work or are developed as a result of the work. Achievement, exhibition, intraception, dominance and heterosexuality needs did not emerge as significantly different among problem solving types. Therefore, one is inclined to believe that these needs

are a function of management position rather than problem solving type. Getting the work done well through others requires certain behaviors that are reflected by the needs of managers.

The lower order needs operate in much the same way. Managers are expected to be decisive leaders, therefore, they are less likely to be deferrent or let others make decisions. Because managers must handle many people in the workplace, they face constant interruption and must have the flexibility to handle crises as they arise. A low need for order, then, would be helpful. A low need for affiliation would allow a more detached approach to handling people, preventing personal involvement with employees. Additionally the low need for abasement and nurturance is perhaps necessary for survival among management ranks. As a manager, one cannot feel guilty about decisions which must be enforced; managers are paid to get results.

Problem Definition Exercise

Four distinct categories of responses emerged from the problem definition exercise. A chi-square test for independence was undertaken to test for a relationship between problem solving type and category of response. The contingency table, Table X, reveals the observed and expected frequencies of results among research subjects. The null and alternate hypotheses are stated as follows.

H_o : Problem Solving style and Category of Problem definition are independent.

H_a : Problem solving style and category of problem definition are not independent.

TABLE X

TABLE OF OBSERVED AND EXPECTED FREQUENCIES*

Category	Idea Finder	Problem Definer	Planner	Implementer	Total
Regrets	(1) 2	(1) 1	(3) 2	(2) 3	7
Facts	(5) 3	(3) 3	(5) 5	(5) 7	18
Solutions	(4) 5	(2) 4	(4) 6	(14) 9	24
Puzzlement	(3) 3	(6) 3	(5) 5	(5) 7	18
Total	13	12	17	25	68

*Observed Frequencies are indicated in parentheses ( ).

Because of small frequencies in some cells, a non-parametric approach was desired even though statistically this procedure is not as powerful as its parametric equivalent. The critical value for six degrees of freedom and an alpha of .05 is 12.59. Since the computed value, 11.45, is smaller than the critical chi-square value, the differences found between the observed and expected frequencies were not large enough to reject the null hypothesis of independence at the .05 level of significance. Thus, it is not possible to show a statistical relationship between problem solving style and approach to the problem situation.

This result may be misleading, however. In analyzing cognitive style, one expects that the problem definer, who entertains new ideas continuously, would respond to a situation with puzzlement. One would also expect that implementers, who are results oriented, would respond to situations with solutions in mind. Fact finders would be likely to restate facts in the process of gathering information. Planners could also be expected to offer solutions because of their responsibility in plotting a course of action. For the most part, these expectations held true. True to type, most managers approached problems as expected. The regrets category did not reveal particular insights, however. Being the smallest category, it may simply reflect the need for abasement among some managers studied. Since this need is not particularly desirable in managers, it may usually be subordinated. On the other hand, in our non-threatening test situation, it may mean that true needs were allowed to surface. It may also reflect an insecurity on the part of "new" managers who are not yet hardened veterans.

Discriminant Analysis

The discriminant analysis was run originally with all variables present even though some were found to be lacking in significance earlier. Five variables survived the stepwise discriminant procedure: organization, level of management, extraversion, sensing, and level of education. The first discriminant function had an eigenvalue of 0.24172 which

accounted for 47.88 percent of variance with canonical correlation of .441. Eigenvalues for the remaining two functions were 0.172 and 0.087; percentage of explained variance were 34.82 and 17.30; canonical correlations were 0.387 and 0.2839 respectively. Wilks' lamdas of each function were 0.630, 0.782, 0.920. The first and second lamda were significant at less than .05; the third could not be considered significant with 0.12. The full results of this analysis can be found in Appendix E.

Results of the discriminant function are reported in Table XI. The function explaining the most variance, function 1, separated implementers from the other groups. Implementers were: (1) more likely to be extroverted; (2) more likely to be sensing types; (3) less likely to have advanced degrees.

The second function differentiated planners from other groups. Planners were more likely to have advanced degrees and were predominantly found in the newspaper industry sampled here. The third function differentiated fact finders from other groups. Fact Finders were more likely to be found at higher levels of management than other group members.

The classification analysis, in Table XII, revealed that approximately 51 percent of the cases used in the discriminant analysis could be correctly classified. The functions were most successful at classifying the implementers. Table XII also shows that two-thirds of the respondents were either implementers or planners. Only one-third of the respondents

TABLE XI

RESULTS OF DISCRIMINANT ANALYSIS*

VARIABLE	FUNCTIONS		
	1	2	3
Canonical Discriminant Functions Evaluated at Group Centroids			
Fact Finders	-0.349	-0.408	-0.517
Problem Definers	0.507	-0.701	0.311
Planners	0.580	0.414	-0.144
Implementers	-0.438	0.181	0.196
Standardized Discriminant Function Coefficients			
Organization	0.463	-0.542	0.062
Level of Management	0.172	-0.268	0.852
Level of Education	0.074	0.844	0.037
Extraversions/Introversion	0.693	0.302	0.122
Sensing/Intuiting	0.650	-0.245	-0.410

*Of the eighty-two possible cases, five were excluded because of missing values on variables used to create the "group" variable; two were excluded because of missing discriminating variables.

could be considered fact finders or problem definers. Additionally, nearly forty percent of the managers studied were implementation oriented. Another twenty-five percent were planning oriented. Among the group of managers studied, only sixteen percent were oriented toward problem definition.

The small group of problem definers identified for this study are not easily described. Problem definers and fact finders, for the most part, were less educated than either planners or implementers. This finding supports the idea that formal training, especially in schools of business, may breed a manager whose attention is focused on getting things done as

TABLE XII

RESULTS OF CLASSIFICATION ANALYSIS

Actual Group	Predicted Group Membership*				
	N	1	2	3	4
I Fact Finder	14	7 (50%)	1 (7.1%)	2 (14.3%)	4 (28.6%)
II Problem Definer	12	3 (25%)	6 (50%)	3 (25%)	0 (0%)
III Planner	20	2 (10%)	3 (15%)	9 (45%)	6 (30%)
IV Implementer	30	6 (20%)	1 (3.3%)	6 (20%)	17 (56.7%)

*Percent of grouped cases correctly classified: 51.32%

instructed. These are not independent thinkers who ask uncomfortable questions in their search for the underlying causes of their problems. Since the problem definers in this study tended to reside at the high end of the management hierarchy or had specialized functions, experience or positional situation may allow them to function as assimilators of information, conceptualizing ideas, opportunities, or benefits more easily than others.

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Chapter V

RESULTS, LIMITATIONS, CONCLUSIONS, AND AVENUES FOR FUTURE RESEARCH

The purpose of this research was to discover problem definers and determine what unique attributes or cognitive characteristics they possess. The Basadur Problem Solving Inventory was used to identify problem definers who were hypothesized to be intuitive, perceptive, introverted thinking types and who prefer ideation to evaluation, reside at lower ends of the management hierarchy, have non-business educations, have high needs for endurance, autonomy, intraception and change, and exhibit puzzlement when faced with a problem situation. Research findings were reported in Chapter Four. The findings suggest preliminary profiles that can be drawn of problem definers on which future research can be based.

Results

> Hypothesis 1: Problem definers have as their chief motivation the desire to thoroughly understand the nature of a problem; therefore, they are intuitive, perceptive, introverted thinkers in distilling disparate observations into integrated explanations.

Hypothesis 1 was not supported. In terms of cognitive style, problem definers were not found to be intuitive or

perceptive. Only half of those studied were introverted. They were, however, found to be predominantly thinking types.

Function 1 of the discriminant analysis revealed that while implementers were highly sensing oriented and extraverted, no other groups were clearly distinguishable on this basis. In terms of cognitive style and problem solving type, problem definers were more likely to exhibit intuiting orientations than either implementers or planners, and were equally likely to be sensing or intuiting types. Additionally, problem definers were not found to be perceptive, with eighty-three percent preferring judging to perceiving. Further, the perception/judging variable was discarded from the stepwise discriminant analysis as not being significant in identifying any of the problem solving types. However, as thinking, judging types, these problem definers are particularly suited to the business environment where facts and logical principles are desired. They approach problems impersonally and objectively. Such detachment can help the process of problem definition in that new ideas are not rejected on the basis of personal feelings.

Because of the introversion/extraversion split, it appears that there might be two types of problem definers. One type might be considered the conceptualizer of ideas, the introvert. This person would focus on the development and judgment of ideas, as in pure research. The other type might be considered the applier of ideas, the extravert. This person

would focus on the development and judgment of ideas as they relate to the outside environment, as in applied research. Depending on the nature of the work, one type may be preferred over another. For example, the introvert can thrive in a research and development environment. The extravert would thrive best in an administrative environment dealing with people and systems.

> Hypothesis 2: Problem definers have a high sensitivity and appreciation of ideas; therefore, they prefer non-judgmental, imaginative ideation.

Hypothesis 2 was not supported. Problem definers did not prefer non-judgmental, imaginative ideation in considering problems. Overall, the managers tested here preferred evaluation to ideation two to one. Since evaluation requires an individual to make judgmental decisions on the basis of collected facts, this result is consistent with the cognitive styles found for this group. Additionally, the chi square test revealed that it was not possible to show any statistical relationship between the preference for ideation and problem solving type.

The logical, factual, thinking orientation of these individuals does not allow unconscious ideas and associations to influence judgments. Therefore, ideation is suppressed among half of those studied. The business environment hones evaluation skills and preferences to the virtual exclusion of ideation. This phenomenon can be seen in the natural impluse to automatically evaluate negatively almost any new idea, espe-

cially if it is unusual. The tendency is to slip into evaluation rather than participate in ideation. As judgment grows, imagination dwindles. After years and years of practice, almost any new idea can be shown to be wrong, immediately and logically. This tendency works against problem definition and can be used, in part, to explain the small number of problem definers found in this study.

> Hypothesis 3: Problem defining skill is developed experientially; therefore, the problem definer will have experience in understanding problems. However, since organizations reward results rather than understanding, the problem definer will likely be in lower positions in organizations.

Interpreting findings for hypothesis 3 was complex. All of the managers studied indicated that they had at least ten years of experience in solving problems. Self image, individual perception, and confusion in language may confound this finding. Solving problems means many things to many people. Not only those who achieve results, but also those who try to achieve results perhaps with little effect, may consider themselves to be problem solvers. As managers who have been in the workplace ten years or more, these people may have felt that dealing with problems had become second nature. However, dealing with problems and solving them may be separate and unrelated activities. One reason that so many problems may have to be dealt with could be the fact that symptoms are addressed rather than problems.

A full thirty-three percent of the problem definers were classified as belonging to upper levels of management. However, another twenty-five percent of these problem definers were responsible for specialized activities within their respective organizations without being responsible for the direct supervision of subordinates. If one considers that upper management oversees the activities of the organization rather than the activities of specific individuals, the problem definers studied have responsibilities more like those of upper mangement. In this respect, hypothesis 3 would have no support.

Additionally, lower level managers may not have the responsibility or authority to handle problems they may recognize in the workplace. However, given the small sample of problem definers that emerged, this result may simply reflect the working of chance. It is likely that level of management survived as a variable in the stepwise discriminant analysis procedure because fact finders predominated at the upper end of the management scale.

> Hypothesis 4: Problem defining skill is not traditionally taught in schools of business; therefore, the problem definer will have a non-business education.

Partial support was obtained for hypothesis 4. Sixty-eight percent of the problem definers had non-business educations. However, type of education was not considered as significant as level of education in the discriminant analysis. Eighty-

three percent of the problem definers had bachelors degrees. No problem definers had more than a bachelor degree and all had some college education. It could be concluded, then, that the higher the level of education, the more evaluative and results oriented one becomes. As knowledge and judgment on which to base evaluation expands, managers become less adept at defining problems and more adept at selecting and implementing alternatives. Since experience, as well as knowledge, is valued in business organizations, the experienced knowledge worker is likely to be promoted to positions where authority and responsibility for problem solving is commensurate with ability to take action. Unfortunately, the action taken may be inappropriate because of the tendency to slip into evaluation prematurely thus avoiding full problem definition.

> Hypothesis 5: Problem definers form associations and insights, conceptualize new ideas, and search for integrated explanations; therefore, problem definers have a high need for autonomy, endurance, change, and intraception.

Hypothesis 5 was not supported. This sample of problem definers did not have a significantly higher need for autonomy, intraception, change, or endurance than the other problem solving types. Rather, the problem definers studied here had higher needs for affiliation and nurturance. The need for nurturance reflects a desire to assist others while the need for affiliation reflects a desire to be loyal and do things for others. In this sample there were an equal number of introverts and extraverts all of whom were primarily

judging, thinking types. The introverts probably need the encouragement and support of friends in the workplacce to gain acceptance for their ideas. The extraverts, who may not be formally rewarded by the organization for their talents, need the support of friends in the workplace to reinforce confidence in their own abilities. Such support helps develop loyalties and a desire to reciprocate on the part of the problem definer. This means, then, that those who support problem definers in their efforts to understand problems can gain invaluable ideas for dealing with those problems later. This notion assumes that problem definers usually define problems but it is up to others to act on them.

> Hypothesis 6: Problem definers prefer not to have to prioritize or implement decision-making; therefore, they will exhibit puzzlement when faced with a problem situation.

Inconclusive results were obtained for hypothesis 6. Fifty percent of the problem definers studied exhibited puzzlement when faced with a problem scenario. Problem definers conceptualize new ideas, excel at inductive reasoning, and are concerned primarily with understanding a problem. Their approach to a problem situation would involve generation of other information from given information. The emphasis would be on variety of output from the same source. This person is not looking for a single correct answer to a problem and does not merely apply rational analytic procedures to pre-set tasks provided by those in authority. As a result, when approaching ideas, instead of answers, more questions arise.

The chi square test for independence did not suggest a relationship between problem solving style and approach to the problem situation. However, given the closeness of the calculated chi square value to the critical value, this hypothesis deserves further attention. One is led to believe that with a twenty-five percent normal probability of problem definers choosing any of the four problem solving approaches, a fifty percent distribution in the puzzlement category may be important. Small sample size again may be the culprit for a failure to find a significant relationship.

Limitations and Conclusions

Of the seventy-seven research subjects studied, only twelve problem definers emerged. Such a lack of problem definers may be due to several factors. First, it is possible that as Livingston, Basadur, Leavitt and others suggest, the person who can adequately define problems is rare in modern organizations. Educational programs may not teach problem defining skills and organizations may not encourage the development and use of these skills among managers. Both problem definers and fact finders were relatively scarce among management in the organizations studied here with only one-third residing in both of these categories. A full two-thirds of the sample managers could be considered planners and implementers. This finding may not be unusual given the fact that managers are charged with responsibility for getting things done and are, therefore, motivated to accomplish results.

However, it is not encouraging to believe that among managers, few are able to properly identify their problems. These are the people who are charged with responsibility for implementing solutions designed to solve the problem, yet they act on incomplete information and poorly defined problems.

If the wrong solutions are implemented, long term results will be lacking. Cognition, then, plays a vital role. The manager who perceives a problem to be important, especially to superiors, will spend time working at achieving a desired state. This manager will approach problems in the exposition mode, striving to please rather than delving deeply into the problem. Because management evaluation focuses on getting things done, what is being done may carry more weight than what is being accomplished--a subtle, yet important distinction.

In the world of the modern, complex organization, activity is often more visible than results. The ambitious manager wants to be noticed and embarks, perhaps mistakenly, on the road to "looking good" rather than "wasting time" asking questions and delving deeply into the problem. This phenonmenon may be part of the reason that planners and implementers predominate in organizations. These problem solving types are skilled in the area of planning to get things done and in implementing plans. However, they lack motivation to divine the true nature of their problems.

There is, of course, another plausible explanation for the small number of problem definers found in this study. Chance may be the culprit. First, the organizations who agreed to participate in this study may not be representative of the universe of organizations. Second, the managers studied may simply have been an unrepresentative sample. Because individual participants volunteered their time for this study, it may be that problem definers had less time to dedicate to projects such as this and were unavailable for testing. As has been suggested, it is probable that problem definers may not be promoted to management ranks because of their personal needs characteristics and cognitive styles. In any event, it is difficult to generalize from such a small sample.

It is also necessary to question the adequacy of the Basadur Simplex in identifying problem definers. Since the problem definer is not fully understood nor the process of problem definition easily discovered, it is difficult to recognize the person or identify the skill as yet. The literature would indicate that individuals who are adept at problem definition possess unique characteristics. Measurement of these characteristics is, at best, difficult. As with all exploratory research, the attempt here is merely to determine what direction the search for problem definers and problem defining skills should take. Tentative hypotheses have been suggested based on the assumption that such people can be identified and such skills discovered.

The term problem solving itself presents an interesting dilemma because all of the managers perceived themselves to be problem solvers. It is perhaps the shortcoming of the language that anyone charged with "getting things done through others" perceives himself to be a problem solver. Certainly managers must work daily to keep people motivated to get the job done properly within a given time frame. Often this responsibility includes dealing with the shortcomings of individuals in terms of job skill or interpersonal skill, all of which can be called problems. However, dealing with shortcomings and solving problems may be two separate items. One can smooth ruffled feathers without solving the problem of having an individual in a group who has different values or methods of operating than the rest of the group. Efforts must be focused on long term solutions in terms of solving problems. Conceptual clarity is needed in the terminology.

Avenues for Future Research

It was noted that few problem definers emerged from among the sample of managers studied here. Individuals with common cognitive styles may be attracted to the business arena. Briggs found that production managers, certified public accountants, business administrators, those who make business contacts or head manufacturing concerns predominantly have ESTJ cognitive styles. These individuals are results oriented, excel at straightforward tasks and impersonal problems, and are systematic and decisive in dealing with those

problems. They might also tend to select professions that allow them to use such skills.

Organizations have endeavored to match people to jobs. In a management position, accomplishing results, an orientation toward detail, and solid decision making ability are preferred. As a result, those who exhibit such skill would be selected for management positions. Other types may reside in the organization, but are not recognized as having management potential. It may be that a better balance of skills exists in organizations, but not at the management level. However, given the fact that the need for problem defining skills has been decried, the organization would benefit from creating a better balance of these skills in its management pool. A fruitful avenue for future research would compare managers to non-managers to see if there is any validity to such a claim.

In the event that problem definers do exist in organizations at lower levels, that these organizations must select managers differently if problem definition skills are to be tapped. Selection criteria would need to be examined carefully. Future research could also investigate the type of environment desired by problem definers. If hiring or promotion practices, or highly structured environments mitigate the effectiveness of problem definers, organizations in need of this type of talent will need to reevaluate their policies and modify them accordingly.

The variety of literature that relates to problem definition is revealing also. Problem definition is a very complex process one that has been researched from several different viewpoints. These viewpoints have not been assimilated into one body of knowledge nor have they been applied to the field of management. Given that the managers studied here have essentially fallen into two groups, the literature can be viewed from the prespective of two dichotomies as illustrated in Figure 6.

Convergent Thinking	Divergent Thinking
Left Hemisphere oriented	Right Hemisphere oriented
Action oriented	Discovery Oriented
Factual Type	Perceptive type
Extravert	Introvert
Evaluative	Ideative
Business Education	Liberal Arts Education
Pragmatic	Creative
Exposition Mode	Hypothetical Mode
Pragmatic	Creative

Fig. 6--Dichotomy of Management Types

Future research could determine how or why these characteristics affect problem definition and ultimately the organization. Such research could serve to integrate the varied approaches to studying problem solving and aid in the development of a body of knowledge on the process of problem definition.

Although the sample of problem definers here may be considered unusual, education is an important aspect of the process.

Business organizations are beginning to realize that traditional management methods have not been adequate to meet the type and magnitude of problems they are faced with. Seminars are being conducted to "untrain" managers; to teach them to explore the myriad possibilities available in terms of solving problems or even in thinking about how to approach them. An effort was made to explore the type of education that might prove valuable for problem definers, but findings are limited. Non-business education seemed to predominate but more research is needed not only in the types of education which prove to be more useful, but also in how curricula could be developed in traditional training fields that would develop such skills in individuals.

Generalizability of the findings is not possible at this point. Problem definers were not found to proliferate in organizations. This may reflect one of the shortcomings of the instrument chosen to identify this type of problem solver. Alternatively, the sample may reveal a genuine lack of such people in organizations or it may simply mean that the sample studied here was unrepresentative of the general management population. These preliminary findings deserve more attention when group sizes are more equal and can be more easily compared.

With regard to cognitive skill, problem definers appear to be predominantly thinking types. Basadur has suggested that problem solvers must develop creative approaches to viewing

their problems with judgmental and converging thinking being delayed until imaginative non-judgmental diverging thinking has been adequately developed. This study did not attempt to distinguish between these two types of thinking. Further investigation is needed to determine whether Basadur's hypothesis is correct.

In general this study has barely scratched the surface of the problem defining process. Much more information is needed about the nature of these types of individuals, their environments, and the role the environment plays on their abilities. A larger group of problem definers must be identified for analysis. This quest may not be easy, especially if these types shy away from the business environment. However, business needs to be aware of the rich resource they may be losing as a result and attempt to attract such individuals and nurture them. As society becomes ever increasingly complex, such skills will be more and more necessary.

As applied to organizations, systems theory requires that the natural tendency toward disorder in a system requires a continuous flow of energetic regulation or adjustment. It is the manager who must provide the energy both in physical and human resources. Natural law dictates negative entropy occurs in organizations to preserve the basic character of a system. As it relates to problem solving, it is a given that countervailing action will be taken against deviations from the expected. In order to conserve energy within the entire

system, proper problem definition must occur. Otherwise, the system will destroy itself by exhausting its resources.

APPENDIX A

Selection of Participant Organizations

The four participant organizations used in this study were affiliated with the Chief Executive Round Table (CERT), an organization restricted to chief executive officers of Metroplex based companies. Officers of companies who have total responsibility for a local division or region of a company with corporate offices outside the Dallas/Fort Worth metroplex may also be members. CERT is an organization within the Professional Development Institute (PDI) at North Texas State University. PDI is a non-profit organization which provides continuing education programs for the business community.

Twelve chief executives were contacted about participating in this study on problem definition. Four of those contacted agreed to circulate memoranda to their managers asking for volunteer participants. This method of obtaining participants was effective in that eighty-one managers gave at least two hours of their time to take the battery of research instruments. Such methodology, however, is fraught with hazards.

First, this method resulted in self-selection of participants rather than a more rigorous and accepted probability sampling technique. This constraint precludes the ability of the researcher to make assertions about the broader management population. Second, a sampling frame listing all managers in each organization was not prepared as the researcher was not

able to obtain such a listing. Most private sector organizations consider such information proprietary. As a result, the data collected from this sample may not be representative of all managers within a single organization, much less of managers in general. The sample survey findings, then, can only be taken as representative of the managers studied. An ultimate disadvantage of this method is an inability to estimate the degree of error of the sample findings. Finally, since only organizations belonging to PDI and more specifically, the Chief Executive Round Table were studied, this sample of organizations cannot be considered representative of all business organnizations in the metroplex or of businesses in general. Only relatively large organizations whose executives were interested in continuing education would be represented.

In general, the methodology used was one of convenience. In this initial stage of examining the characteristics of problem definers, only the broad applicability of the characteristics identified by the research instruments was explored to uncover variables indicative of problem defining skills.

APPENDIX B

Code

____ 1. Name _____

____ 2. Place of Employment _____

____ 3. Type of Industry employed _____

____ 4. What position do you currently hold?

1 First line supervisor
2 Lower management
3 Middle management
4 Upper management
5 Other Please specify_____

____ 5. Are you often asked to solve problems at work?

1 Yes
2 No
3 Sometimes

____6. How much experience have you had at solving problems at work?

1 Less than 2 years
2 2 - 5 years
3 5 - 10 years
4 10 - 15 years
5 15 - 20 years
6 20 - 25 years
7 More than 25 years

____ 7. Do you often find yourself playing the role of detective in trying to understand what the problem is?

1 Yes
2 No
3 Sometimes

____ 8. Which of the following models do you use most frequently to identify your problems?

1 The planning model - we are deviating from our plan
2 The historical model - we are deviating from past performance
3 Other people's models - customers, competitors, or others within the organization define the problem
4 Extra-organizational model - we are trying to implement techniques that we see elsewhere or hear about in our efforts to improve performance
5 Other Please specify_____
_____

____ 9. In what field of education have you received most of your education?

1 Business
2 Engineering
3 Economics
4 Mathematics
5 Science
6 Other Please specify_____
_____

____10. What is the highest level of education that you have actually completed?

1 Grade School
2 Some highschool
3 Highschool
4 Some College
5 Bachelor's Degree
6 Master's Degree
7 Other Please specify_____

____11. Do you regard yourself as

1 White
2 Black
3 Mexican American
4 Other Please specify_____

____12. Please specify your marital status

1 Married
2 Single
3 Divorced
4 Separated
5 Widowed

____13. At what educational institution did you receive your highest level of schooling_____

____14. Location_____

____15. Into which age category do you belong?

1 20 - 25	5 41 - 45	9 61 - 65
2 26 - 30	6 46 - 50	10 Over 66
3 31 - 35	7 51 - 55	
4 36 - 40	8 56 - 60	

On the paper provided please answer the following questions to the best of your ability.

16. Briefly describe your administrative and business experience to date.

17. Briefly describe your primary job responsibilities at the current time.

18. What things and attributes in the environment do you look for and attend to in guiding your behavior on the job?

19. What kind of information do you find most relevant or useful to you on the job? Why?

20. Describe your most significant learning experience on the job. How has this experience influenced your beliefs, behavior, or expectations?

21. Describe your problem solving technique. (How you feel you usually approach problems.)

22. If you were asked to tell a new manager what you have learned over the years about solving problems in your position of responsibility, what would it be?

APPENDIX C

Edwards Personal Preference Needs

1. ach Achievement: To do one's best, to be successful, to accomplish tasks requiring skill and effort, to be a recognized authority, to accomplish something of great significance, to do a difficult job well, to solve difficult problems and puzzles, to be able to do things better than others, to write a great novel or play.

2. def Deference: To get suggestions from others, to find out what others think, to follow instructions and do what is expected, to praise others, to tell others that they have done a good job, to accept the leadership of others, to read about great men, to conform to custom and avoid the unconventional, to let others make decisions.

3. ord Order: To have written work neat and organized, to make plans before starting on a difficult task, to have things organized, to keep things neat and orderly, to make advance plans when taking a trip, to organize details of work to keep letters and files according to some system, to have meals organized and a definite time for eating, to have things arranged so that they run smoothly without change.

4. exh Exhibition: To say witty and clever things, to tell amusing jokes and stories, to talk about personal adventures and experiences, to have others notice and comment upon one's appearance, to say things just to see what effect it will have on others, to talk about personal achievements, to be the center of attention, to use words that others do not know the meaning of, to ask questions others cannot answer.

5. aut Autonomy: To be able to come and go as desired, to say what one thinks about things, to be indepenent of others in making decisions, to feel free to do what one wants, to do things that are unconventional, to avoid situations where one is expected to conform, to do things without regard to what others may think, to criticize those in positions of authority, to avoid responsibilities and obligations.

6. aff Affiliation: To be loyal to friends, to participate in friendly groups, to do things for friends, to form new friendships, to make as many friends as possible, to share things with friends, to do things with friends rather than alone, to form strong attachments, to write letters to friends.

7. int Intraception: To analyze one's motives and feelings, to observe others, to understand how others feel about problems, to put one's self in another's place, to judge people by why they do things rather than by what they do, to analyze the behavior of others, to analyze the motives of others, to predict how others will act.

8. suc Succorance: To have others provide help when in trouble, to seek encouragement from others, to have others be kindly, to have others be sympathetic and understanding about personal problems, to receive a great deal of affection from others, to have others do favors cheerfully, to be helped by others when depressed, to have others feel sorry when one is sick, to have a fuss made over one when hurt.

9. dom Dominance: To argue for one's point of view, to be a leader in groups to which one belongs, to be regarded by others as a leader, to be elected or appointed chairman of committees, to make group decisions, to settle arguments and disputes between others, to persuade and influence others to do what one wants, to supervise and direct the actions of others, to tell others how to do their jobs.

10. aba Abasement: To feel guilty when one does something wrong, to accept blame when things do not go right, to feel that personal pain and misery suffered does more good than harm, to feel better when giving in and avoiding a fight than when having one's own way, to feel the need for confession of erors, to feel depressed by inability to handle situations, to feel timid in the presence of superiors, to feel inferior to others in most respects.

11. nur Nurturance: To help friends when they are in trouble, to assist others less fortunate, to treat others with kindness and sympathy, to forgive others, to do small favors for others, to be generous with others, to sympathize with others who are hurt or sick, to show a great deal of affection toward others, to have others confide in one about personal problems.

12. chg Change: To do new and different things, to travel, to meet new people, to experience novelty and change in daily routine, to experiment and try new things, to eat in new and different places, to try new and different jobs, to move about the country and live in different places, to participate in new fads and fashions.

13. end Endurance: To keep at a job until it is finsihed, to complete any job undertaken, to work hard at a task, to keep at a puzzle or problem until it is solved, to work at a single job before taking on others, to stay up late working in order to get a job done, to put in long hours of work without distraction, to stick at a problem even though it may seem as

if no progress is being made, to avoid being interrupted while at work.

14. het Heterosexuality: To go out with members of the opposite sex, to engage in social activities with the opposite sex, to be in love with someone of the opposite sex, to kiss those of the opposite sex, to be regarded as physically attractive by those of the opposite sex, to participate in discussions about sex, to read books and plays involving sex, to become sexually excited.

15. agg Aggression: To attack contrary points of view, to tell others what one thinks about them, to criticize others publicly, to make fun of others, to tell others off when disagreeing with them, to get revenge for insults, to become angry, to blame others when things go wrong, to read newspaper accounts of violence.

APPENDIX D

Complete Chi Square Calculations for Preference of Ideation over Evaluation

Cell	Category	O	E	O-E	$(O-E)^2$	$(O-E)^2/E$
1	I-ideate	4	4	0	0	0.00
2	I-evaluate	9	9	0	0	0.00
3	II-ideate	2	4	-2	4	1.00
4	II-evaluate	9	7	2	4	0.57
5	III-ideate	8	7	1	1	0.14
6	III-evaluate	14	15	-1	1	0.07
7	IV-ideate	12	11	1	1	0.09
8	IV-evaluate	19	20	-1	1	0.05

$X^2 = 1.92$

H_o = Variables are independent; preference for ideation is independent of problem solving type.

H_a = Variables are dependent; preference for ideation is dependent on problem solving type.

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04 FEB 85    SPSS-X RELEASE 2.1A FOR IBM OS & MVS
00:51:39     NORTH TEXAS STATE UNIVERSITY    NAS/8040          MVS/SP

SPSS INC LICENSE NUMBER:     939

TRIAL PERIOD FROM 01 NOV 84 FOR 4 MONTHS

                    NEW FEATURES IN SPSS-X RELEASE 2.1
          FOR MORE DETAILS, USE THE COMMAND:  INFO OVERVIEW FACILITIES.

             TABLES - FLEXIBLE TABULATION WITH CAMERA-READY OUTPUT.
                      (TABLES IS AN EXTRA-COST OPTION.)
            GET SAS - READS SAS DATA SETS.
             UPDATE - APPLIES UPDATE TRANSACTIONS TO FILES.
            USERGET - USERPROC-LIKE INTERFACE TO CREATE ACTIVE FILES.
          COMPUTE/IF - ADDITIONAL SUPPORT FOR CHARACTER STRINGS.
           DATA LIST - SUPPORT FOR COLUMN-BINARY DATA FILES.
              EXPORT - WRITES FILES YOU CAN SEND BY DATA COMMUNICATIONS.

           USER PROC - ALL EXISTING USER PROCEDURES MUST BE RECOMPILED.
          REGRESSION - NOW LIMITED TO A SINGLE VARIABLES SUBCOMMAND.

PARM FIELD:  48K

  1  0          TITLE DISCRIMHERALD
  2  0          FILE HANDLE DATA1
  3  0          DATA LIST/
  4  0              NAME 1-11 (A)  QUAD 12 NUM 14-15 ORG 17 IND 19 POS 21 SOL 23 EXP 25
  5  0              DET 27 MOD 29 ED 31 LEVED 33 RACE 35 MAR 37 AGE 39 SEX 41 PREF 43
  6  0              COGEI 45 COGSN 47 COGTF 49 COGJP 51

THE ABOVE DATA LIST STATEMENT WILL READ    1 RECORDS FROM FILE INLINE
```

VARIABLE	REC	START	END	FORMAT	WIDTH	DEC
NAME	1	1	11	A	11	
QUAD	1	12	12	F	1	0
NUM	1	14	15	F	2	0
ORG	1	17	17	F	1	0
IND	1	19	19	F	1	0
POS	1	21	21	F	1	0
SOL	1	23	23	F	1	0
EXP	1	25	25	F	1	0
DET	1	27	27	F	1	0
MOD	1	29	29	F	1	0
ED	1	31	31	F	1	0
LEVED	1	33	33	F	1	0
RACE	1	35	35	F	1	0
MAR	1	37	37	F	1	0
AGE	1	39	39	F	1	0
SEX	1	41	41	F	1	0
PREF	1	43	43	F	1	0
COGEI	1	45	45	F	1	0
COGSN	1	47	47	F	1	0
COGTF	1	49	49	F	1	0
COGJP	1	51	51	F	1	0

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END OF DATALIST TABLE.


   7   0           VARIABLE LABELS
   8   0               NAME    'NAME'
   9   0               QUAD    'PROBLEM SOLVING TYPE'
  10   0               NUM     'RESPONDENT'
  11   0               ORG     'PLACE OF EMPLOYMENT'
  12   0               IND     'INDUSTRY OF EMPLOYMENT'
  13   0               POS     'LEVEL OF MGMT'
  14   0               SOL     'SOLVE PROBLEMS'
  15   0               EXP     'EXPERIENCE SOLVING PROBLEMS'
  16   0               DET     'PLAY DETECTIVE'
  17   0               MOD     'MODEL USED'
  18   0               ED      'FIELD OF EDUCATION'
  19   0               LEVED   'LEVEL OF EDUCATION'
  20   0               RACE    'RACE'
  21   0               MAR     'MARITAL STATUS'
  22   0               AGE     'AGE'
  23   0               SEX     'SEX'
  24   0               PREF    'PREFERENCE FOR IDEATION'
  25   0               COGEI   'EXTROVERT INTROVERT'
  26   0               COGSN   'SENSING THINKING'
  27   0               COGTF   'THINKING FEELING'
  28   0               COGJP   'JUDGING PERCEIVING

>WARNING   208  LINE  28, COLUMN 12, TEXT: JUDGING PERCEIVING
>A LITERAL IS NOT CORRECTLY ENCLOSED IN QUOTATION MARKS ON THE COMMAND LINE.
>LITERALS MAY NOT BE CONTINUED ACROSS COMMAND LINES WITHOUT THE USE OF THE
>CONTINUATION SYMBOL '+'.

  29   0           VALUE LABELS
  30   0               QUAD    1 'FINDER' 2 'IDENTIFIER' 3 'PLANNER' 4 'IMPLEMENTER'/
  31   0               ORG     0 'TIMESH' 1 'TAB' 2 'BRIKPAK' 3 'MISCL' 4 'NTSU'/
  32   0               IND     1 'PUBLI' 2 'BANKING' 3 'PROD' 4 'ED'/
  33   0               POS     1 'FIRST LINE' 2 'LOWER' 3 'MIDDLE' 4 'UPPER' 5 'OTHER'/
  34   0               SOL     1 'YES' 2 'NO' 3 'SOMETIMES'/
  35   0               EXP     1 'LT2' 2 '2-5' 3 '5-10' 4 '10-15' 5 '15-20' 6 '20-25'
  36   0                       7 'MT 25'/
  37   0               DET     1 'YES' 2 'NO' 3 'SOMETIMES'/
  38   0               MOD     1 'PLANNING' 2 'HISTORICAL' 3 'OTHERS' 4 'EXTRAORG' 5 'OTH'/
  39   0               ED      1 'BUS' 2 'ENGR' 3 'ECON' 4 'MATH' 5 'SCI' 6 'OTHER'/
  40   0               LEVED   1 'GRADE' 2 'SHS' 3 'HS' 4 'SCOL' 5 'BA' 6 'MA' 7 'OTHER'/
  41   0               RACE    1 'WHITE' 2 'BLACK' 3 'MEX' 4 'OTHER'/
  42   0               MAR     1 'MARRIED' 2 'SINGLE' 3 'DIVORCED' 4 'SEPARATED'
  43   0                       5 'WIDOWED'/
  44   0               AGE     1 '20-25' 2 '26-30' 3'31-35' 4 '36-40' 5 '41-45' 6 '46-50'
  45   0                       7 '51-55' 8 '56-60' 9 '61-65' 10 'OVER 65'/
  46   0               SEX     0 'MALE' 1 'FEMALE'/
  47   0               PREF    0 'EVALUATE' 1 'IDEATE'/
  48   0               COGEI   0 'EXTROVERT' 1 'INTROVERT'/
  49   0               COGSN   0 'SENSING' 1 'INTUITING'/
  50   0               COGTF   0 'THINKING' 1 'FEELING'/
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  51  0              COGJP  0 'JUDGING' 1 'PERCEIVING'/
  52  0          MISSING VALUES
  53  0              POS,SOL,EXP,DET,MOD,ED,LEVED,RACE,MAR,AGE (0)/
  54  0          DISCRIMINATE GROUPS=QUAD (1,4)/
  55  0              VARIABLES=ORG,POS,ED,LEVED,PREF,COGEI,COGSN,COGTF,COGJP/
  56  0              ANALYSIS=ORG,POS,ED,LEVED,PREF,COGEI,COGSN,COGTF,COGJP/
  57  0              METHOD=MAHAL/
  58  0          STATISTICS   11 12 13 14 15 16

THERE ARE   271696 BYTES OF MEMORY AVAILABLE.
THE LARGEST CONTIGUOUS AREA HAS   271696 BYTES.


THIS DISCRIMINANT ANALYSIS REQUIRES     25460 (      24.9K) BYTES OF WORKSPACE.
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- D I S C R I M I N A N T A N A L Y S I S -

ON GROUPS DEFINED BY QUAD PROBLEM SOLVING TYPE

77 (UNWEIGHTED) CASES WERE PROCESSED.
2 OF THESE WERE EXCLUDED FROM THE ANALYSIS.
0 HAD MISSING OR OUT-OF-RANGE GROUP CODES.
2 HAD AT LEAST ONE MISSING DISCRIMINATING VARIABLE.
75 (UNWEIGHTED) CASES WILL BE USED IN THE ANALYSIS.

NUMBER OF CASES BY GROUP

QUAD	NUMBER OF CASES UNWEIGHTED	WEIGHTED	LABEL
1	13	13.0	FINDER
2	12	12.0	IDENTIFIER
3	20	20.0	PLANNER
4	30	30.0	IMPLEMENTER
TOTAL	75	75.0	

- D I S C R I M I N A N T A N A L Y S I S -

ON GROUPS DEFINED BY QUAD PROBLEM SOLVING TYPE

ANALYSIS NUMBER 1

STEPWISE VARIABLE SELECTION

SELECTION RULE: MAXIMIZE MINIMUM MAHALANOBIS DISTANCE (D SQUARED) BETWEEN GROUPS

MAXIMUM NUMBER OF STEPS	18
MINIMUM TOLERANCE LEVEL	0.00100
MINIMUM F TO ENTER	1.0000
MAXIMUM F TO REMOVE	1.0000

CANONICAL DISCRIMINANT FUNCTIONS

MAXIMUM NUMBER OF FUNCTIONS	3
MINIMUM CUMULATIVE PERCENT OF VARIANCE	100.00
MAXIMUM SIGNIFICANCE OF WILKS' LAMBDA	1.0000

PRIOR PROBABILITY FOR EACH GROUP IS 0.25000

---------- VARIABLES NOT IN THE ANALYSIS AFTER STEP 0 ----------

VARIABLE	TOLERANCE	MINIMUM TOLERANCE	F TO ENTER	D SQUARED	BETWEEN GROUPS	
ORG	1.0000000	1.0000000	1.3923	.1417894D-01	1	4
POS	1.0000000	1.0000000	1.8482	.5315595D-01	3	4
ED	1.0000000	1.0000000	.65863			
LEVED	1.0000000	1.0000000	2.5287	.1255109D-01	1	2
PREF	1.0000000	1.0000000	.67790			
COGEI	1.0000000	1.0000000	3.0345	.7661738D-01	2	4
COGSN	1.0000000	1.0000000	2.2380	.0	2	3
COGTF	1.0000000	1.0000000	.86337			
COGJP	1.0000000	1.0000000	.29300			

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* *

AT STEP 1, COGEI WAS INCLUDED IN THE ANALYSIS.

		DEGREES OF FREEDOM			SIGNIF.	BETWEEN GROUPS	
WILKS' LAMBDA	0.88635	1	3	71.0			
EQUIVALENT F	3.03449		3	71.0	0.0347		
MINIMUM D SQUARED	.766174D-01					2	4
EQUIVALENT F	.656720		1	71.0	0.4204		

---------------- VARIABLES IN THE ANALYSIS AFTER STEP 1 ----------------

VARIABLE	TOLERANCE	F TO REMOVE	D SQUARED	BETWEEN GROUPS
COGEI	1.0000000	3.0345		

---------------- VARIABLES NOT IN THE ANALYSIS AFTER STEP 1 ----------------

VARIABLE	TOLERANCE	MINIMUM TOLERANCE	F TO ENTER	D SQUARED	BETWEEN GROUPS	
ORG	0.9997207	0.9997207	1.2993	.9492083D-01	1	4
POS	0.9997246	0.9997246	1.8291	.2161449	2	4
ED	0.9990017	0.9990017	.63704			
LEVED	0.9928283	0.9928283	2.0701	.2692903	2	4
PREF	0.9776301	0.9776301	.65398			
COGSN	0.9904921	0.9904921	2.4136	.1740439	2	3
COGTF	0.9993477	0.9993477	.85325			
COGJP	0.9911379	0.9911379	.33694			

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AT STEP   2, LEVED    WAS INCLUDED IN THE ANALYSIS.

                                      DEGREES OF FREEDOM  SIGNIF.   BETWEEN GROUPS
WILKS' LAMBDA        0.81412          2     3      71.0
EQUIVALENT F         2.52683                6     140.0  0.0236

MINIMUM D SQUARED     .269290                                        2        4
EQUIVALENT F         1.13785                2      70.0  0.3264

--------------- VARIABLES IN THE ANALYSIS AFTER STEP   2 ---------------

VARIABLE  TOLERANCE  F TO REMOVE    D SQUARED       BETWEEN GROUPS

LEVED     0.9928283   2.0701
COGEI     0.9928283   2.5606

--------------- VARIABLES NOT IN THE ANALYSIS AFTER STEP   2 ---------------

                      MINIMUM
VARIABLE  TOLERANCE  TOLERANCE  F TO ENTER      D SQUARED        BETWEEN GROUPS

ORG       0.9370848  0.9306241   1.7299         .4001259           1        4
POS       0.9916652  0.9848245   1.8544         .4411999           2        4
ED        0.9549017  0.9490008   1.0221         .3326519           1        2
PREF      0.9768187  0.9700528    .66415
COGSN     0.9869781  0.9843613   2.3575         .3362658           1        2
COGTF     0.9513429  0.9451366    .36404
COGJP     0.9634210  0.9634210    .33033
```

* *

AT STEP 3, POS WAS INCLUDED IN THE ANALYSIS.

		DEGREES OF FREEDOM			SIGNIF.	BETWEEN GROUPS	
WILKS' LAMBDA	0.75338	3	3	71.0			
APPROXIMATE F	2.30450		9	168.1	0.0182		
MINIMUM D SQUARED	.441200					2	4
EQUIVALENT F	1.22506		3	69.0	0.3072		

--------------- VARIABLES IN THE ANALYSIS AFTER STEP 3 ---------------

VARIABLE	TOLERANCE	F TO REMOVE	D SQUARED	BETWEEN GROUPS
POS	0.9916652	1.8544		
LEVED	0.9848245	2.0925		
COGEI	0.9922453	2.5354		

--------------- VARIABLES NOT IN THE ANALYSIS AFTER STEP 3 ---------------

VARIABLE	TOLERANCE	MINIMUM TOLERANCE	F TO ENTER	D SQUARED	BETWEEN GROUPS	
ORG	0.9369167	0.9230406	1.6976	.6266039	1	4
ED	0.9519388	0.9434716	.99143			
PREF	0.9416472	0.9416472	.46096			
COGSN	0.9792848	0.9792848	2.2871	.7709209	1	4
COGTF	0.9084559	0.9084559	.41956			
COGJP	0.9356870	0.9356870	.11097			

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AT STEP   4, COGSN    WAS INCLUDED IN THE ANALYSIS.

                                      DEGREES OF FREEDOM  SIGNIF.   BETWEEN GROUPS
WILKS' LAMBDA          0.68433         4    3       71.0
APPROXIMATE F          2.31491             12      180.2  0.0090

MINIMUM D SQUARED      .770921                                           1        4
EQUIVALENT F           1.67416              4       68.0  0.1661

--------------- VARIABLES IN THE ANALYSIS AFTER STEP   4 ---------------

VARIABLE  TOLERANCE  F TO REMOVE    D SQUARED        BETWEEN GROUPS

POS       0.9839354    1.7920
LEVED     0.9821989    2.0421
COGEI     0.9833282    2.7053
COGSN     0.9792848    2.2871

--------------- VARIABLES NOT IN THE ANALYSIS AFTER STEP   4 ---------------

                     MINIMUM
VARIABLE  TOLERANCE  TOLERANCE  F TO ENTER     D SQUARED         BETWEEN GROUPS

ORG       0.9252707  0.9225831   1.9297        .8636173             1        4
ED        0.8989596  0.8989596   .65467
PREF      0.9086619  0.9086619   .76356
COGTF     0.9080223  0.9080223   .41627
COGJP     0.8844110  0.8844110   .21801
```

* *

AT STEP 5, ORG WAS INCLUDED IN THE ANALYSIS.

		DEGREES OF FREEDOM			SIGNIF.	BETWEEN GROUPS
WILKS' LAMBDA	0.62990	5	3	71.0		
APPROXIMATE F	2.25219		15	185.4	0.0062	
MINIMUM D SQUARED	.863617					1 4
EQUIVALENT F	1.47830		5	67.0	0.2086	

---------------- VARIABLES IN THE ANALYSIS AFTER STEP 5 ----------------

VARIABLE	TOLERANCE	F TO REMOVE	D SQUARED	BETWEEN GROUPS
ORG	0.9252707	1.9297		
POS	0.9834001	1.7714		
LEVED	0.9225831	2.4618		
COGEI	0.9830871	2.6580		
COGSN	0.9671122	2.5167		

---------------- VARIABLES NOT IN THE ANALYSIS AFTER STEP 5 ----------------

VARIABLE	TOLERANCE	MINIMUM TOLERANCE	F TO ENTER	D SQUARED	BETWEEN GROUPS
ED	0.8519501	0.8519501	.39399		
PREF	0.9048763	0.9048763	.56434		
COGTF	0.8388001	0.8388001	.36948		
COGJP	0.8631547	0.8631547	.78271D-01		

F LEVEL OR TOLERANCE OR VIN INSUFFICIENT FOR FURTHER COMPUTATION.

SUMMARY TABLE

STEP	ACTION ENTERED	REMOVED	VARS IN	WILKS' LAMBDA	SIG.	MINIMUM D SQUARED	SIG.	BETWEEN GROUPS		LABEL
1	COGEI		1	.88635	.0347	.07662	.4204	2	4	EXTROVERT INTROVERT
2	LEVED		2	.81412	.0236	.26929	.3264	2	4	LEVEL OF EDUCATION
3	POS		3	.75338	.0182	.44120	.3072	2	4	LEVEL OF MGMT
4	COGSN		4	.68433	.0090	.77092	.1661	1	4	SENSING THINKING
5	ORG		5	.62990	.0062	.86362	.2086	1	4	PLACE OF EMPLOYMENT

CLASSIFICATION FUNCTION COEFFICIENTS
(FISHER'S LINEAR DISCRIMINANT FUNCTIONS)

QUAD =	1 FINDER	2 IDENTIFIER	3 PLANNER	4 IMPLEMENTER
ORG	.1348416	.5105674	.1399707	-.6114323D-01
POS	1.967552	2.826132	2.204678	2.367425
LEVED	3.618932	3.477310	4.332674	4.094191
COGEI	.6701261	1.926920	2.614931	1.090679
COGSN	3.132587	3.739692	3.656509	2.090749
(CONSTANT)	-12.87090	-16.37699	-18.19550	-15.72269

CANONICAL DISCRIMINANT FUNCTIONS

FUNCTION	EIGENVALUE	PERCENT OF VARIANCE	CUMULATIVE PERCENT	CANONICAL CORRELATION	AFTER FUNCTION	WILKS' LAMBDA	CHI-SQUARED	D.F.	SIGNIFICANCE
					0	0.6299045	32.122	15	0.0062
1*	0.24172	47.88	47.88	0.4412120	1	0.7821675	17.075	8	0.0293
2*	0.17581	34.82	82.70	0.3866814	2	0.9196804	5.8192	3	0.1207
3*	0.08733	17.30	100.00	0.2834071					

* MARKS THE 3 CANONICAL DISCRIMINANT FUNCTIONS REMAINING IN THE ANALYSIS.

STANDARDIZED CANONICAL DISCRIMINANT FUNCTION COEFFICIENTS

	FUNC 1	FUNC 2	FUNC 3
ORG	0.46338	-0.54152	0.06207
POS	0.17162	-0.26816	0.85154
LEVED	0.07385	0.84375	0.03653
COGEI	0.69261	0.30167	0.12204
COGSN	0.64999	-0.24500	-0.40998

STRUCTURE MATRIX:

POOLED WITHIN-GROUPS CORRELATIONS BETWEEN DISCRIMINATING VARIABLES AND CANONICAL DISCRIMINANT FUNCTIONS
(VARIABLES ORDERED BY SIZE OF CORRELATION WITHIN FUNCTION)

	FUNC 1	FUNC 2	FUNC 3
COGEI	0.64038*	0.39242	0.15202
ORG	0.41569*	-0.29744	0.13124
ED	0.29424*	-0.00979	0.00296
LEVED	0.22006	0.72638*	0.16501
COGTF	0.08717	-0.23387*	-0.20534
POS	0.11175	-0.18160	0.89063*
COGSN	0.50527	-0.24068	-0.50945*
COGJP	0.08395	-0.00487	-0.26027*
PREF	0.15112	0.08224	-0.22581*

UNSTANDARDIZED CANONICAL DISCRIMINANT FUNCTION COEFFICIENTS

	FUNC 1	FUNC 2	FUNC 3
ORG	.2869210	-.3353035	.3843149D-01
POS	.1582740	-.2473078	.7853074
LEVED	.6792931D-01	.7761171	.3360527D-01
COGEI	1.437842	.6262670	.2533491
COGSN	1.367911	-.5156132	-.8628137
(CONSTANT)	-2.502195	-2.582071	-2.386053

CANONICAL DISCRIMINANT FUNCTIONS EVALUATED AT GROUP MEANS (GROUP CENTROIDS)

GROUP	FUNC 1	FUNC 2	FUNC 3
1	-0.34864	-0.40807	-0.51737
2	0.50720	-0.70132	0.31110
3	0.57999	0.41411	-0.14366
4	-0.43846	0.18128	0.19553

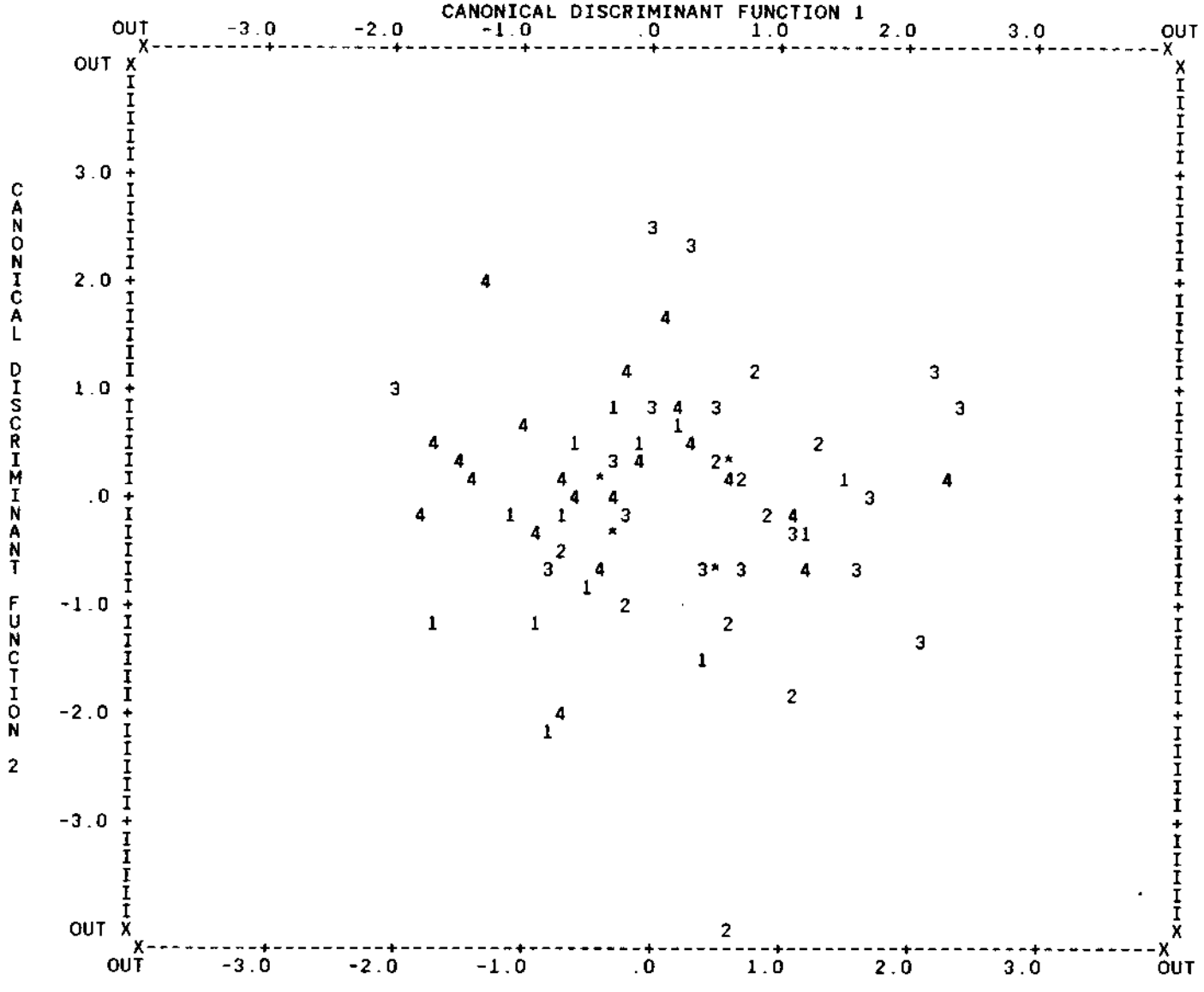
CASE SEQNUM	MIS VAL	SEL	ACTUAL GROUP		HIGHEST PROBABILITY GROUP	P(D/G)	P(G/D)	2ND HIGHEST GROUP	P(G/D)	DISCRIMINANT SCORES...		
1			4		4	0.5926	0.4788	1	0.3733	-1.7557	-0.2195	0.1043
2			1	**	2	0.8937	0.4251	3	0.3219	1.2084	-0.3562	0.2801
3			4		4	0.7826	0.4313	3	0.3377	-0.2499	1.1829	0.3912
4			4		4	0.6289	0.6177	1	0.2007	-1.5295	0.3093	0.9232
5			3		3	0.7640	0.3285	4	0.3170	-0.2519	0.8171	-0.6913
6			2	**	3	0.8746	0.4842	2	0.2718	1.2763	0.4199	0.3137
7			3	**	4	0.9700	0.2950	1	0.2717	-0.1615	-0.2063	0.0604
8			4		4	0.7826	0.4313	3	0.3377	-0.2499	1.1829	0.3912
9			1	**	4	0.9637	0.3483	3	0.3067	-0.0936	0.5698	0.0940
10			4		4	0.7826	0.4313	3	0.3377	-0.2499	1.1829	0.3912
11			4	**	3	0.8906	0.3938	2	0.2793	1.0501	-0.1089	-0.5052
12			4		4	0.6359	0.5716	1	0.2771	-1.6877	0.5566	0.1379
13			3		3	0.0892	0.4755	4	0.4435	0.0442	2.4878	1.2438
14			4		4	0.5926	0.4788	1	0.3733	-1.7557	-0.2195	0.1043
15			1	**	3	0.7640	0.3285	4	0.3170	-0.2519	0.8171	-0.6913
16			2	**	3	0.2394	0.6001	1	0.2321	0.8015	1.1619	-2.0422
17			3	**	4	0.9928	0.3950	3	0.2437	-0.3178	0.4067	0.3576
18			4	**	1	0.9699	0.3733	4	0.2717	-0.3198	0.0410	-0.7249
19			4		4	0.5926	0.4788	1	0.3733	-1.7557	-0.2195	0.1043
20			1		1	0.2472	0.5679	3	0.2100	-0.6364	0.5356	-2.2955
22			4	**	1	0.9828	0.4642	4	0.2100	-0.3877	-0.7351	-0.7585
23			3	**	4	0.9928	0.3950	3	0.2437	-0.3178	0.4067	0.3576
24			1		1	0.3290	0.6858	4	0.1395	-0.7043	-0.2405	-2.3291
25			3	**	1	0.1267	0.4585	4	0.4251	-2.0043	1.0512	-1.4327
26			4	**	1	0.2647	0.7126	2	0.1646	-0.6819	-2.0401	-1.6110
27			2	**	1	0.8872	0.3319	2	0.3217	-0.2295	-0.9824	0.0268
28			4		4	0.5926	0.4788	1	0.3733	-1.7557	-0.2195	0.1043
29			1	**	4	0.6557	0.3728	3	0.3034	0.1953	0.6002	1.2150
30			4	**	3	0.5606	0.4563	4	0.3754	0.1050	1.6237	0.4633
31			3	**	4	0.8673	0.3663	3	0.3508	0.0370	0.8476	0.4297
32			4		4	0.8673	0.3663	3	0.3508	0.0370	0.8476	0.4297
33			1	**	4	0.8186	0.5089	1	0.3001	-1.4008	0.2213	0.1763
34			1		1	0.5136	0.6004	4	0.2638	-1.6949	-1.0836	-0.6762
35			3	**	4	0.8673	0.3663	3	0.3508	0.0370	0.8476	0.4297
36			4		4	0.8186	0.5089	1	0.3001	-1.4008	0.2213	0.1763
37			2		2	0.6101	0.3182	4	0.2950	0.4822	0.2649	1.2534
38			3	**	4	0.3504	0.4452	2	0.3292	-0.7973	-0.6086	1.7854
39			4		4	0.4368	0.5455	2	0.2177	-0.7294	0.1675	1.8190
40			1	**	3	0.5698	0.5576	2	0.1895	1.5336	0.2439	-1.1800
41			2		2	0.9063	0.5791	4	0.1506	0.5706	-1.1242	0.9226
42			3		3	0.6884	0.4879	2	0.3088	1.6919	-0.0034	-0.3947
43			4		4	0.8957	0.5184	1	0.2312	-1.0460	0.6621	0.2484
44			4	**	3	0.9298	0.3523	4	0.3008	0.3240	0.5123	0.4681
45			4	**	3	0.9560	0.3924	4	0.2848	0.1657	0.7596	-0.3172
46			3		3	0.2969	0.6138	4	0.2765	0.3015	2.3118	-0.2500
47			4	**	1	0.7054	0.4518	3	0.2151	0.3827	-0.7176	-1.3949
48			3	**	1	0.7054	0.4518	3	0.2151	0.3827	-0.7176	-1.3949
49			3		3	0.1448	0.3947	1	0.3069	1.5943	-0.6202	-1.9605
50			4	**	1	0.6801	0.3878	4	0.2763	-0.8949	-1.2254	0.2196

CASE SEQNUM	MIS VAL	SEL	ACTUAL GROUP	HIGHEST PROBABILITY GROUP	P(D/G)	P(G/D)	2ND HIGHEST GROUP	P(G/D)	DISCRIMINANT SCORES...		
51			2	2	0.6991	0.5339	3	0.2347	1.0561	-0.4057	1.3303
52			4	** 2	0.2887	0.6750	3	0.1594	1.2143	-0.6530	2.1156
53			1	1	0.1907	0.6214	2	0.2060	0.4434	-1.5817	-2.1754
54			4	** 1	0.8370	0.5544	4	0.2347	-0.8566	-0.2900	-1.2790
55			2	** 3	0.9866	0.3779	2	0.2480	0.7395	0.0890	-0.2403
56			2	** 1	0.9867	0.4377	4	0.2764	-0.6983	-0.5373	-0.4937
57			1	1	0.3817	0.5545	2	0.2724	-0.8342	-2.0895	-0.5609
58			3	** 2	0.9465	0.3684	1	0.2459	0.6716	-0.6872	-0.2739
59			2	** 1	0.8416	0.3150	4	0.2967	-0.5400	-0.7846	0.2916
60			2	2	0.5569	0.7668	1	0.0859	1.1444	-1.7949	0.9994
61			1	1	0.8416	0.3150	4	0.2967	-0.5400	-0.7846	0.2916
62			3	** 2	0.6991	0.5339	3	0.2347	1.0561	-0.4057	1.3303
63			2	2	0.9184	0.3829	3	0.3134	0.8978	-0.1584	0.5450
64			4	** 3	0.3629	0.5637	2	0.3182	2.3336	0.1021	-0.2842
65			3	3	0.3150	0.7296	2	0.1751	2.4016	0.8783	-0.2506
66			3	3	0.2541	0.7914	2	0.1020	2.2433	1.1256	-1.0359
67			4	4	0.3708	0.4341	2	0.2933	-0.0876	0.2730	1.9294
68			3	3	0.3150	0.7296	2	0.1751	2.4016	0.8783	-0.2506
69			4	4	0.3708	0.4341	2	0.2933	-0.0876	0.2730	1.9294
70			2	2	0.0017	0.9007	1	0.0834	0.5858	-4.5640	0.8266
71			3	** 2	0.4100	0.7150	3	0.1781	2.0691	-1.3621	0.3954
72			3	3	0.6633	0.4915	1	0.2477	0.5185	0.8346	-1.3277
73			4	** 3	0.9233	0.3399	2	0.2867	0.6109	0.1769	0.5065
74			1	1	0.6801	0.3878	4	0.2763	-0.8949	-1.2254	0.2196
75			4	4	0.8482	0.4658	2	0.2081	-0.6008	0.0795	1.0721
76			1	** 4	0.9092	0.4409	1	0.3163	-1.1139	-0.1140	0.2148
77			4	4	0.1114	0.4504	1	0.2779	-1.2946	1.9328	-1.2886

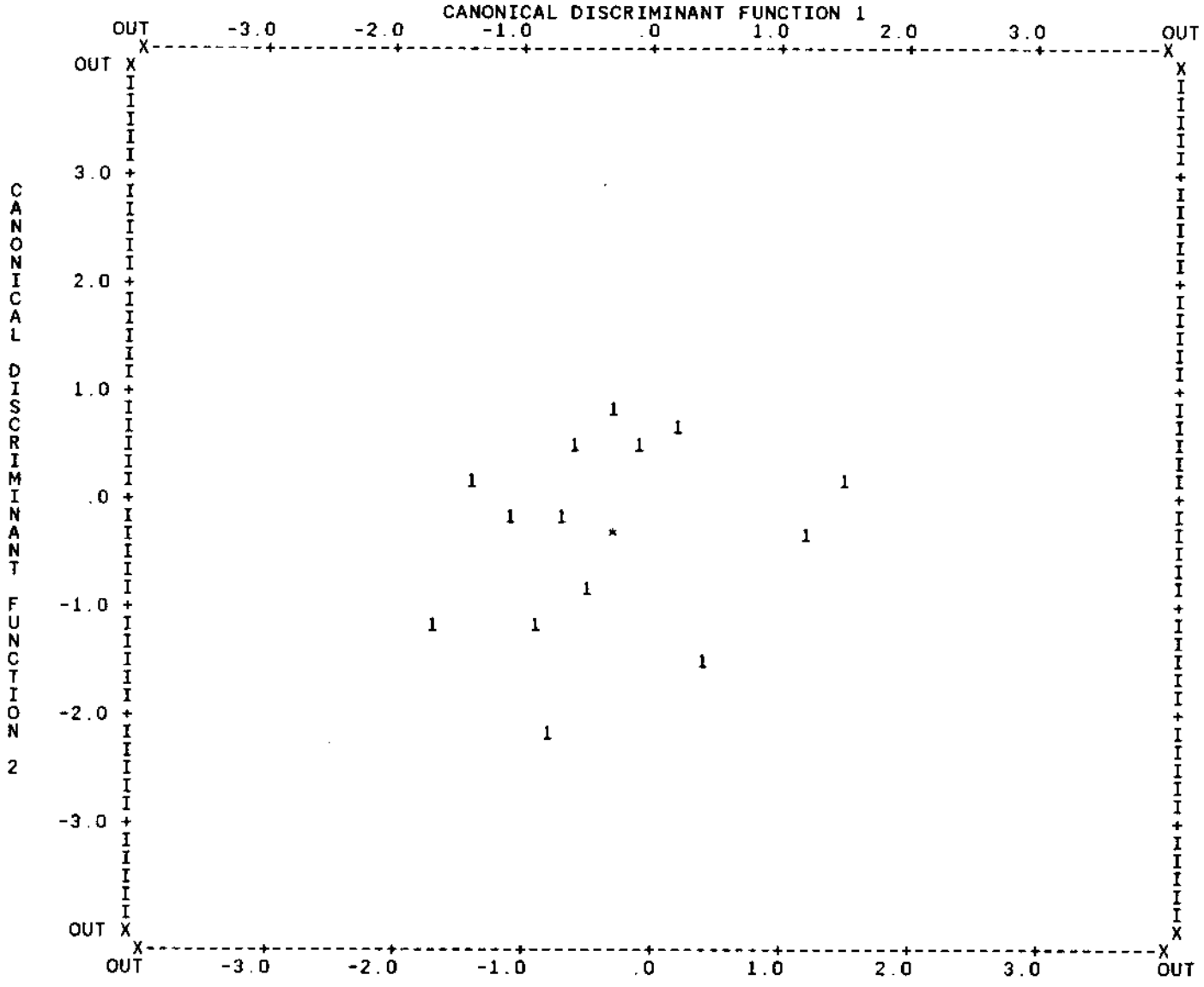
SYMBOLS USED IN PLOTS

SYMBOL	GROUP	LABEL
1	1	FINDER
2	2	IDENTIFIER
3	3	PLANNER
4	4	IMPLEMENTER
*		GROUP CENTROIDS

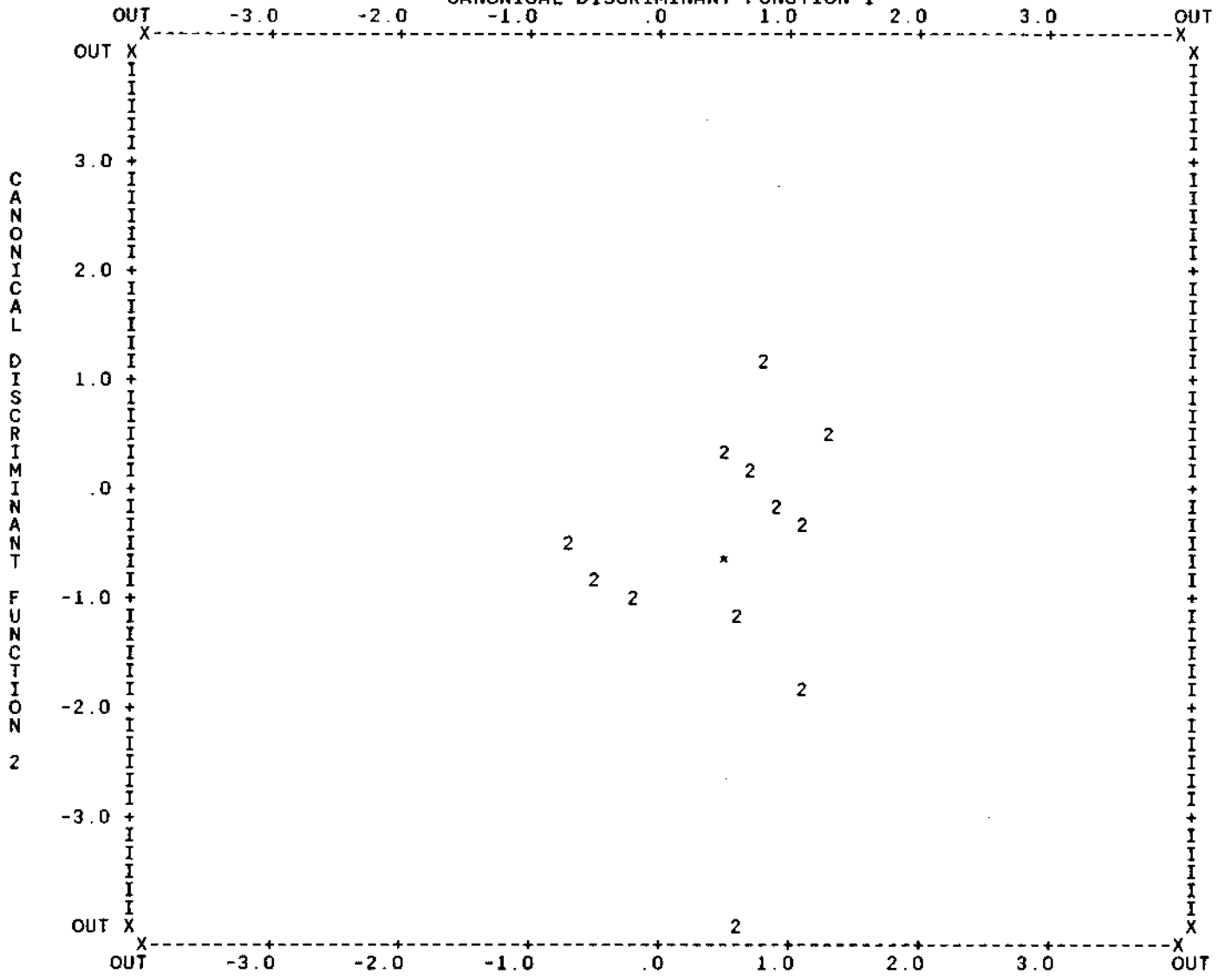
ALL-GROUPS SCATTERPLOT - * INDICATES A GROUP CENTROID



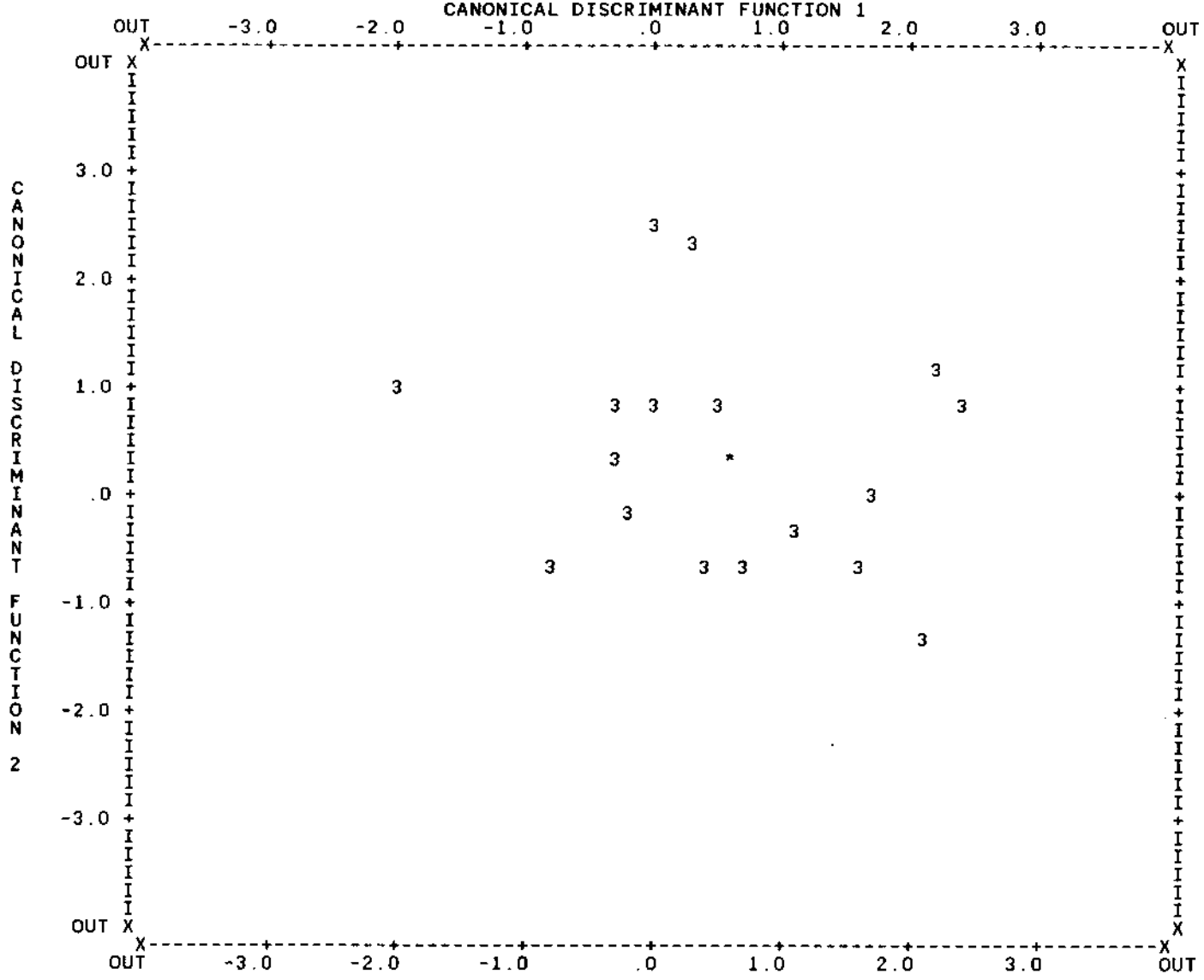
GROUP 1 FINDER * INDICATES A GROUP CENTROID



GROUP 2 IDENTIFIER * INDICATES A GROUP CENTROID

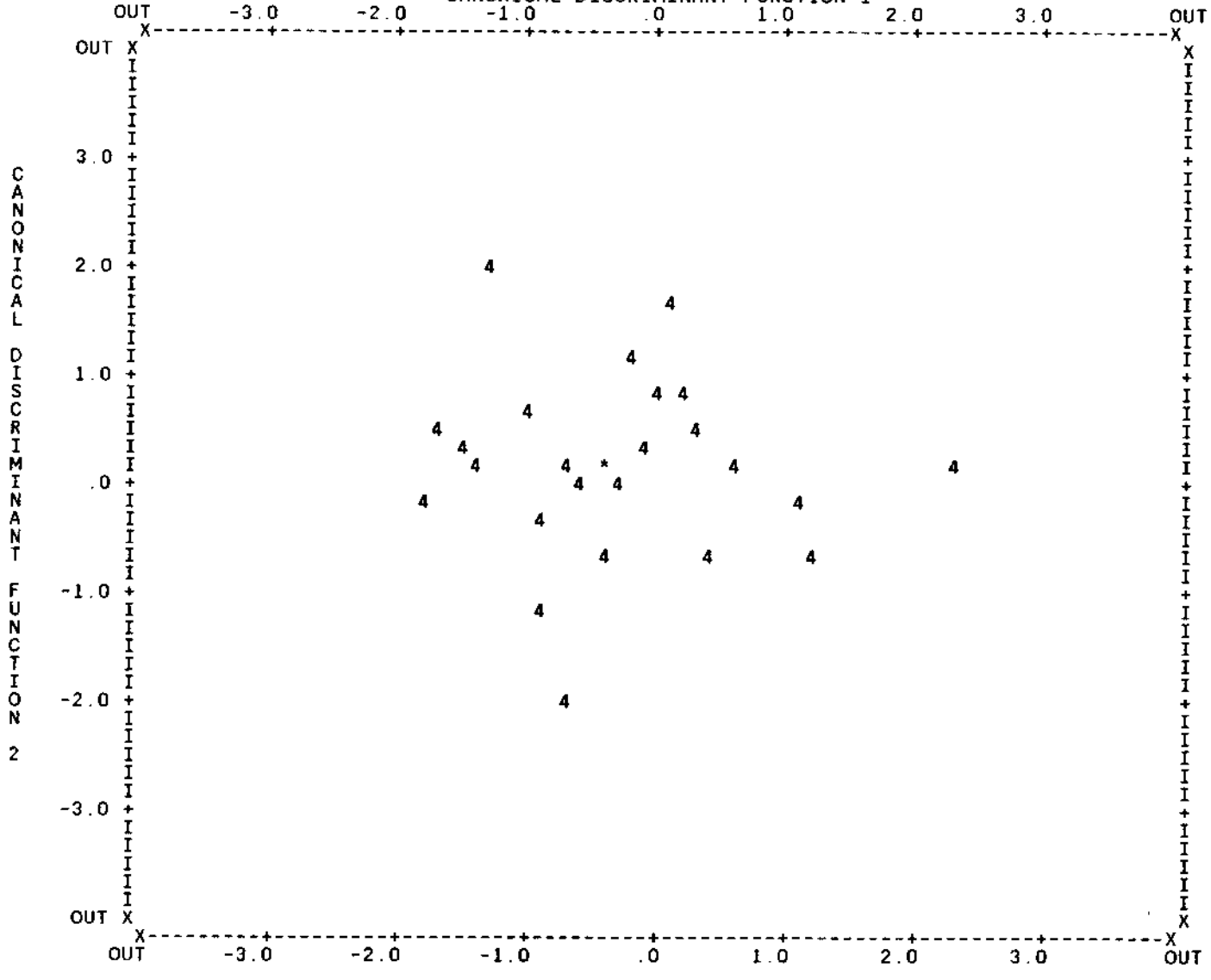


GROUP 3 PLANNER * INDICATES A GROUP CENTROID



GROUP 4 IMPLEMENTER * INDICATES A GROUP CENTROID

CANONICAL DISCRIMINANT FUNCTION 1



CLASSIFICATION RESULTS -

ACTUAL GROUP	NO. OF CASES	PREDICTED GROUP MEMBERSHIP 1	2	3	4
GROUP 1 FINDER	14	7 50.0%	1 7.1%	2 14.3%	4 28.6%
GROUP 2 IDENTIFIER	12	3 25.0%	6 50.0%	3 25.0%	0 0.0%
GROUP 3 PLANNER	20	2 10.0%	3 15.0%	9 45.0%	6 30.0%
GROUP 4 IMPLEMENTER	30	6 20.0%	1 3.3%	6 20.0%	17 56.7%

PERCENT OF "GROUPED" CASES CORRECTLY CLASSIFIED: 51.32%

CLASSIFICATION PROCESSING SUMMARY

77 CASES WERE PROCESSED.
0 CASES WERE EXCLUDED FOR MISSING OR OUT-OF-RANGE GROUP CODES.
1 CASES HAD AT LEAST ONE MISSING DISCRIMINATING VARIABLE.
76 CASES WERE USED FOR PRINTED OUTPUT.

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