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## Problem Management: Learning from Experience



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For many scholars who study organizations and management, the central characteristic of organizations is that they are problem-solving systems whose success is measured by how efficiently they solve the routine problems associated with accomplishing their primary mission and how effectively they respond to the emergent problems and opportunities associated with survival and growth in a changing world. The vitality and success of organizations are determined, in this view, by “doing the right thing” (problem finding) and by “doing things right” (problem solving). Kilmann’s approach (1979, pp. 214-215) is representative of this perspective: “One might even define the essence of management as problem defining and problem solving, whether

The problem-management model described here was developed in collaboration with Richard Baker and Juliann Spoth.

the problems are well structured, ill structured, technical, human, or even environmental. Managers of organizations would then be viewed as *problem managers*, regardless of the types of products and services they help their organizations provide. It should be noted that managers have often been considered as generic decision makers rather than as problem solvers or problem managers. Perhaps decision making is more akin to solving well-structured problems where the nature of the problem is so obvious that one can already begin the process of deciding among clear-cut alternatives. However, decisions cannot be made effectively if the problem is not yet defined and if it is not at all clear what the alternatives are, can, or should be." In this view, the core task of the executive is problem management. Although experience, personality, and specific technical expertise are important, the primary skill of the successful executive is the ability to manage the problem-solving process in such a way that important problems are identified and solutions of high quality are found and carried out with the full commitment of organization members.

A problem-management perspective on executive behavior has much promise. It is a rational, proactive view of management, one that is useful for describing, as well as prescribing, executive action. In addition, the framework of problem management has phenomenological validity; it fits well with executives' subjective experiences of their role in managing their organization's problem-finding and problem-solving activities. Yet important criticisms have been made of previous attempts to fit managerial behavior into existing problem-solving models—criticisms that need to be addressed before a problem-management perspective can be taken seriously.

The first of these criticisms was alluded to in the quotation from Kilmann. Previous attempts to describe executive behavior in *problem-solving* or decision-making frameworks are too narrow, excluding a most important strategic executive function—finding and defining the right problems to work on.

A second criticism is that problem-solving models of management are too rational and too linear. Many executive activities appear to be guided more by nonrational, "intuitive" ways

of knowing than by the kind of logical step-by-step analysis suggested in problem-solving models (Mintzberg, 1973a, 1976). As Weick puts it in his contribution to this volume, "Decisions are not made at specific points in time, they accrete. . . . Linear models and step models have only modest relevance to everyday thinking. Even if people tried to implement them, they would find them foreign to what they are trying to do."

Third, theorists who view organizational action as strongly determined by environmental forces see problem-solving models of management as misleading because they are too proactive, failing to recognize the ways in which executive action is reactive, determined by demands from the organization's environment.

Finally, problem-solving models have emphasized individual cognitive aspects of executive behavior at the expense of the socioemotional dimensions of management. Problem management is not just an activity of the individual executive mind; it is fundamentally a social process. Solutions to problems are inevitably combinations, new applications, or modifications of old solutions. From other people we get new dreams, new ideas, information, and help in getting things done. Language, communication, and conflicting views are central in problem management. Particularly in organizations it is difficult to conceive of a problem that does not in some way involve other people either in choosing the problem, in supplying information about it, in helping to solve it, or in implementing the solution.

This chapter is an attempt to realize the promise of the problem-management perspective on executive action by creating a problem-management model that takes account of the forgoing criticisms. This model, based on the theory of experiential learning (Kolb, 1983), conceives of problem management in a way that includes the following:

- Problem finding as well as problem solving.
- A nonlinear description of the process of problem management that is dialectic and emergent.
- Both rational and intuitive modes of knowing.
- Both the active and reflective aspects of the executive role.



- Both the cognitive and social/emotional aspects of problem management.

#### Model of Problem Management Based on the Theory of Experiential Learning

In previous writings (Kolb, Rubin, and McIntyre, 1979; Kolb, 1983) I have argued that an understanding of problem solving and so-called academic learning can be enhanced by viewing both processes as specialized modifications of a single, more holistic, adaptive process of learning from experience. The experiential learning process consists of four phases: concrete experience, reflective observation, abstract conceptualization, and active experimentation. Common-sense notions of problem solving tend to focus on the phases of concrete experience and active experimentation—on the specific difficulties experienced in immediate situations and the actions taken to overcome them. Traditional educational ideas about learning, however, tend to focus on the phases of reflective observation and abstract conceptualization—emphasizing the gathering of information and development of general concepts. Just as it has been proposed that the process of traditional education is improved when the concrete and active emphasis of problem solving is added (Keeton and Tate, 1978; Chickering, 1977), it can correspondingly be suggested that the effectiveness of problem solving is enhanced by the addition of the academic learning perspectives of reflection and conceptualization. In both cases what results is a more holistic and integrated adaptive process.

The model of problem management derived from the theory of experiential learning is, like that theory, holistic and normative. It describes an idealized problem-management process that is characteristic of the fully functioning executive in optimal circumstances. Ineffective problem management is seen as the result of deviations from that normative process because of personal habits and skill limitations or because of situational constraints such as time pressure or limits on access to information that can result from one's position in the organization or from mistrusting relationships with subordinates. The model

consists of four analytic stages, which correspond to the four stages of the experiential learning cycle. Stage one, situation analysis, corresponds to concrete experience; stage two, problem analysis, to reflective observation; stage three, solution analysis, to abstract conceptualization; and stage four, implementation analysis, to active experimentation. These four stages form a nested sequence of analytic activities such that each stage requires the solution of a particular analytic task to properly frame the succeeding stage.

The task of *situation analysis* is to examine the immediate situational context in order to determine the right problem to work on. Although problem-solving activity is often initiated by urgent symptomatic pressures, urgency alone is not a sufficient criterion for choosing which problem to work on. As every manager knows, the press of urgent problems can easily divert attention from more important but less pressing long-term problems and opportunities. Every concrete situation contains a range of problems and opportunities that vary in urgency and importance. Some of these are obvious, while others are hidden or disguised. Situation analysis requires exploration to identify the full range of problems and opportunities in the situation and priority setting to choose the right problem to work on—that is, the problem that takes precedence by criteria of both urgency and importance.

Given the appropriate choice of a problem, the task of *problem analysis* is to properly define the problem in terms of the essential variables or factors that influence it. Here the task is to gather information about the nature of the problem and to evaluate it by constructing a model of the factors that are influencing the problem. This model serves to sort relevant from irrelevant information and guides the search for further information to test its validity. The result of problem analysis is to define the problem so that criteria to be met in solving it are identified.

Given a problem as defined in problem analysis, the third stage, *solution analysis*, seeks to generate possible solutions and to test their feasibility for solving the problem against the criteria defined in stage two. This is the most intensively studied



stage of problem solving, best known through Osborn's (1953) early work on brainstorming.

The solution chosen in solution analysis is next implemented in the fourth stage of problem solving: *implementation analysis*. Tasks essential for implementing the solution must be identified and organized into a coherent plan with appropriate time deadlines and follow-up evaluations. Responsibility for implementing the plan is developed through participation of those individuals and groups not already involved in the problem-solving activity who will be directly affected by the solution. Implementation activities from stage four are carried out in the situation identified in stage one and thus modify that situation, creating new opportunities, problems, and priorities. Effective problem management is thus a continuing iterative cycle paralleling the experiential learning cycle. For example, when the participation of affected individuals is elicited in implementation analysis, new problems and opportunities may come to light as priorities for continuing problem-solving efforts.

Carlsson, Keane, and Martin (1976), using the experiential learning framework, have documented this iterative four-stage problem-solving process in their historical study of R&D projects. Through analysis of monthly project reports and team-member interviews, they studied the histories of R&D projects in a major consumer products R&D laboratory. In one project they found that key steps in the progress of the project could be interpreted as representing a clockwise sequence through the learning model (see Figure 1 and Table 1). Critical examination of this analysis by other project managers and their higher-level R&D managers confirmed that the model represented the realities of the project. In subsequent analysis of other projects they found "instances of stages being skipped, of project teams 'stuck' in a stage, and even instances of reverse movement through the stages. The managers involved generally agreed that the pictures were accurate and that the deviations indicated problems deserving of management attention" (p. 6).

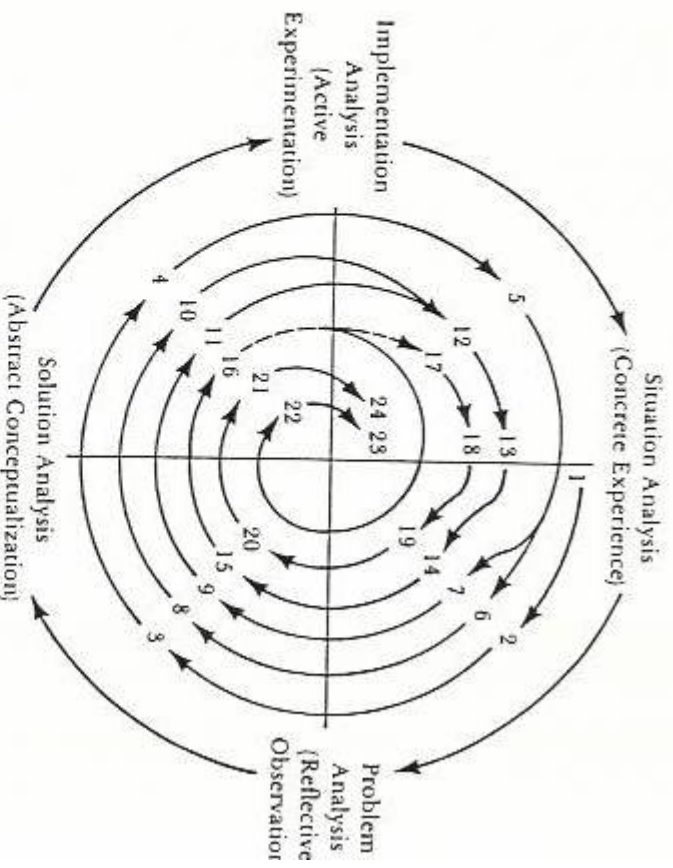
Figure 1 shows the details of the iterative problem-solving process in one of the projects that Carlsson, Keane, and Martin studied. Numbers on the spiral refer to activity descriptions listed

in Table 1. As indicated by the "Type of Analysis" column in Table 1, the sequence of activities in the project followed successive iterations of the four-stage problem-solving model.

*Dialectics of Problem Management.* The protocol of the R&D project activities described above contains another pattern widely recognized by students of creativity and problem solving. The process of problem solving does not proceed in a logical, linear fashion from beginning to end but, rather, is characterized by wavelike expansions and contractions alternately moving outward to gather and consider alternatives, information, and ideas and inward to focus, evaluate, and decide. These expansions and contractions have been variously labeled "green light/red light" in brainstorming (Osborn, 1953), "ideation/evaluation" (Basadur, 1979), and "divergence/convergence" (Guilford and Hoepfner, 1971). The existence of such a pulsation process strongly suggests that problem solving is not the result of a single mental function such as logical thinking but, rather, that effective problem solving involves the integration of dialectically opposed mental orientations. The experiential learning theory of adult cognitive development (Kolb, 1983, chap. 6) offers some insight into the specific dynamics of these dialectical processes as they occur in each of the four analytical stages of problem management. This theory describes the process whereby individual orientations toward the four learning modes become more sophisticated and integrated with one another. A brief overview of the theory will draw out its relevance for problem management. The experiential learning cycle is driven by two sets of dialectically opposed processes, one set of opposing ways to grasp reality and one set of opposing ways to transform reality. In the first set, reality can be grasped by apprehension of concrete experiences or by comprehension of symbolic representations. In the second set, these "prehensions" of reality can be transformed by extension, outwardly oriented active experimentation, or by intention, inwardly oriented reflective observation.

That there are two distinct and dialectically opposed modes of knowing the world or grasping reality has long been recognized by philosophers, most notably the pragmatists. John

Figure 1. Effective Problem Solving as a Process of Experiential Learning: An R&D Project History.



Source: Adapted from Carlsson, Keane, and Martin (1976).

Table 1. R&D Project Activities.

|  | <i>Type of Analysis</i> | <i>Expansion/Contraction</i> |
|--|-------------------------|------------------------------|
| 1. Planning activity initiated by a management question: "What businesses should this division be in?"               | Situation               | E                            |
| 2. Generation of nine alternatives.  | Situation               | E                            |
| 3. Establishment of criteria for selection made jointly with marketing.  | Problem                 | C                            |
| 4. Evaluation of the nine alternatives against the criteria, resulting in the selection of three projects to pursue. | Solution                | C                            |
| 5. Assignments of staff to activate three projects, one of which is the subject of this study.                       | Implementation          | E                            |



Table 1. R&amp;D Project Activities, Cont'd.

|   | <i>Type of<br/>Analysis</i> | <i>Expansion/<br/>Contraction</i> |
|---|-----------------------------|-----------------------------------|
| 6. Identifying the options for positioning the product in the market.   | Situation                   | E                                 |
| 7. Identifying the potential process routes to making the product.  | Situation                   | E                                 |
| 8. Establishing the criteria for deciding the competitive targets.  | Problem                     | C                                 |
| 9. Examining standing criteria in the division for choice of processes and weighing flexibility higher than normal for this project.  | Problem                     | C                                 |
| 10. Deciding on the specific objective for this product.  | Solution                    | C                                 |
| 11. Choosing the process route to be developed.   | Solution                    | C                                 |
| 12. Making the product and placing a consumer test.   | Implementation              | C                                 |
| 13. Obtaining consumer test results that confirmed that the product targets had been met.   | Implementation              | E/C                               |
| 14. Generation of alternatives for obtaining a more favorable economic position in the marketplace.   | Situation                   | E                                 |
| 15. Analyzing the alternatives from the standpoint of the user.   | Problem                     | E                                 |
| 16. Selection of the specific target and the attribute to be optimized.   | Solution                    | C                                 |
| 17. Making the product and placing a consumer test. (The path from 16 to 17 is shown as a broken line because the work was incomplete; that is, the consumer test was placed without having the optimum product.) | Implementation              | C                                 |
| 18. Obtaining and analyzing consumer test results, which were worse than predicted.   | Situation                   | E/C                               |
| 19. Generation of alternatives for the project in view of the outcome of the consumer test.   | Situation                   | E                                 |
| 20. Reexamination of criteria.  | Problem                     | E                                 |
| 21. Optimizing product/process variables.   | Problem                     | C                                 |

*(continued on next page)*

Table 1. R&amp;D Project Activities, Cont'd.

|   | <i>Type of<br/>Analysis</i> | <i>Expansion/<br/>Contraction</i> |
|---|-----------------------------|-----------------------------------|
| 22. Specifying the process details for the test market production and trimming costs to fit within the appropriation. | Solution                    | C                                 |
| 23. Meeting specific requirements for the test market plant.  | Implementation              | C                                 |
| 24. Making product and placing next consumer test.  | Implementation              | C                                 |

Adapted from Carlsson, Kean, and Martin (1976). "Type of Analysis" and "Expansion/Contraction" columns added by the author.

Dewey, for example, states: "Our intellectual process consists . . . of a rhythm of direct understanding technically called *apprehension*—with indirect mediated understanding technically called *comprehension*" (1910, p. 120). In addition, there is considerable physiological evidence that the hemispheres of the human brain are typically specialized around these functions—the left hemisphere on comprehension and the right hemisphere on apprehension (Edwards, 1979; Kolb, 1983). Comprehension is logical, is digital, and operates in linear time, with a past, present, and future. Apprehension is based on sensations and feelings, is holistic, and is synchronous, existing only in the present. Knowing by comprehension is typically accomplished by critical analysis of symbols, while knowing by apprehension is typically accomplished by the appreciative synthesis of the elements of concrete situations.

*Intention* and *extension* are terms that are likewise familiar to philosophers. In logic, *extension* refers to the denotation of a concept, the set of objects in the external world to which the concept applies; *intention* refers to the connotation, or meaning, of the concept—that is, the attributes that make it up (Cohen and Nagel, 1934). The most significant work on these processes, however, is that of Carl Jung, who distinguished between the introverted (intention) and extroverted (extension) ways of knowing. In the extroverted, or extensional, way of dealing

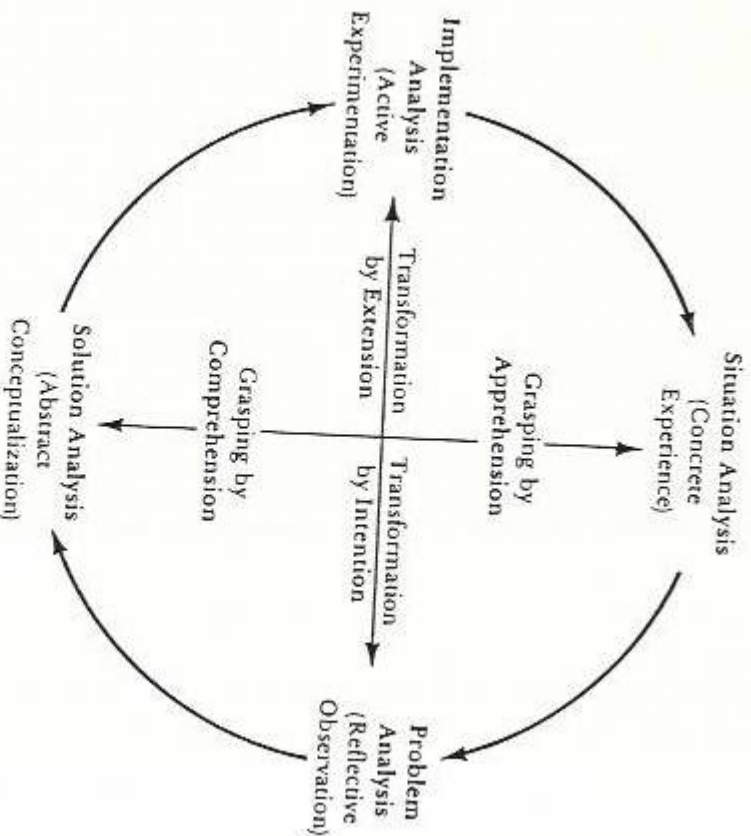
with the world, one emphasizes objects in the world over the subject who perceives them, whereas the introverted (intentional) way of dealing with the world emphasizes subjective meanings over the objects that stimulate them. Jung (1923, p. 13) emphasizes the dialectic relationship between these two processes: "These opposite attitudes are merely opposite mechanisms—a diastolic going out and seizing of the object and a systolic concentration and release of energy from the object seized. Every human being possesses both mechanisms as an expression of his natural life-rhythm." There is some evidence to support a physiological base for these two processes in the differential arousal of the sympathetic and parasympathetic nervous systems (Brownerman and others, 1968; Dickman, 1971), suggesting that when the sympathetic nervous system is dominant, the basic adaptive orientation is outward toward action and mastery of the environment, and when the parasympathetic system dominates, the orientation is receptive, more toward perception and reflection than action.\*

Each of the four learning processes just described is dominant in one of the four problem-solving stages. It is through the process of apprehension that we directly experience situations. Through the process of intentional transformation we determine the meaning of our experiences and define problems. The process of comprehension shapes the generation of solutions—that is, future-oriented conceptualizations of how the problem might be changed—and the process of extensional transformation dominates in the active implementation of solutions (see Figure 2). The developmental theory of experiential learning suggests that the way each of these processes is developed and refined is through service as the focal point for resolution of the dialectic processes of the opposing dimension. Specifically, apprehension of concrete situations is refined and elaborated by the transformation dialectics of intention and extension—that

\*It is not the assumed physiological/anatomical locations of intention/extension and apprehension/comprehension processes that is primary here, for this is currently highly speculative. Rather, what is important is the description and identification of these as pivotal psychological functions in learning.



Figure 2. Basic Learning Processes and the Stages of Problem Management.

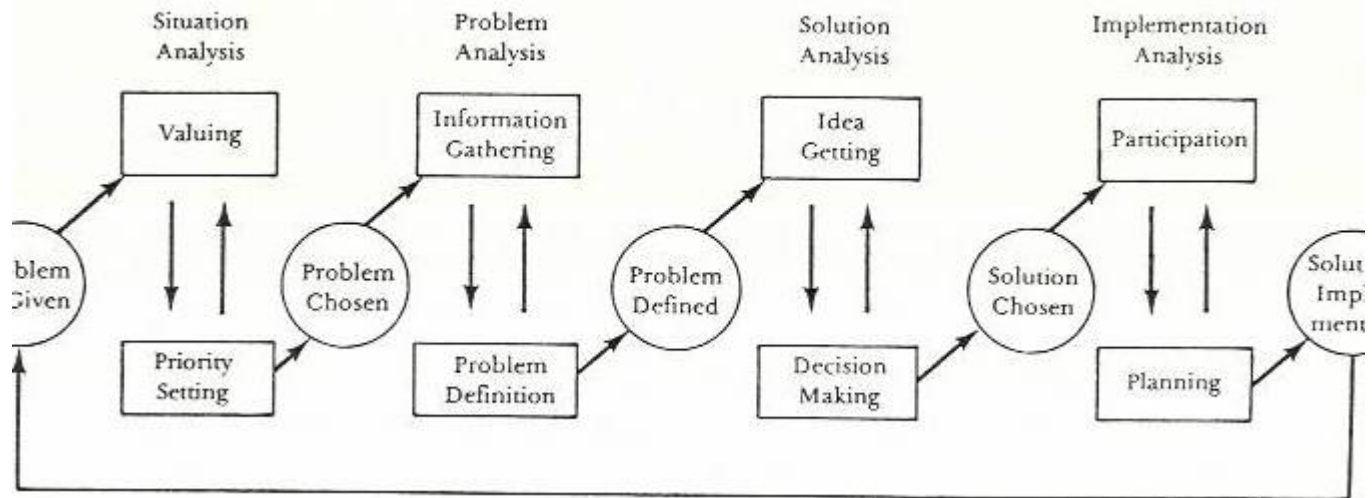


is, by orienting oneself in concrete situations by action (extension) and relating what happens to values (intention). Problems are defined through intention by the integration of the grasping dialectics of apprehension and comprehension—that is, gathering information about the problem and its concrete manifestations (apprehension) and organizing this information into a model or theory about what is causing the problem (comprehension). Comprehension of solutions is developed by the transformation dialectics of intention and extension—that is, developing ideas about how to change critical attributes of the problem (intention) and evaluating the feasibility of these ideas in reality (extension). The process of implementation through extension is refined by the grasping dialectics of apprehension and com-

prehen-sion—that is, plans are developed (compre-hension) and concretely carried out with the involvement of others in the situation (apprehension). The experiential learning model thus suggests specific analytic activities based on dialectic conflict resolution for each stage of problem management. This refined model is diagrammed in Figure 3 and is described below.

*Situation Analysis—Valuing and Priority Setting.* Most problem-solving activity begins with a problem as given—some circumstance, task, or assignment that demands attention. The task of situation analysis is to transform this problem as given into a problem that is consciously chosen to meet the dual criteria of urgency and importance. To understand the dialectics of situation analysis, it is first necessary to understand the nature of problems. A problem is a discrepancy between some desired state or goal and current circumstances in reality. In the simplest sense, problems have three structural components: the current state, or reality (R), the goal (G), and the process whereby reality can be transformed to match the goal state—that is, the solution ( $\rightarrow$ ). Depending on which of these three factors are known, we have different types of problems. When all three are known ( $R \rightarrow G$ ), there is no problem, simply a task to be accomplished. When current circumstances and the desired state are known, but the means for transformation are unknown ( $R \xrightarrow{?} G$ ), we have a structured problem, perhaps the most common form of a problem as given. When both the current state and the means of transformation are unknown ( $R \xrightarrow{?} G$ ), the problem is unstructured and needs to be defined before solutions can be developed. Next comes that particular subclass of problems known as opportunities. These are cases in which the goal is not yet known or articulated.  $R \rightarrow \overset{?}{G}$  defines a structured opportunity such that a current state and means for transforming it exist but no goal has been articulated. Two common examples are a plant with unutilized capacity and a potentially marketable production waste by-product. Finally, there are opportunities that are unstructured in varying degrees:  $R \xrightarrow{?} \overset{?}{G}$ , a known situation without clear goals or ways of achieving them;

Figure 3. Problem Management as a Dialectic Process.





$\dot{R} \rightarrow \dot{G}$ , a known solution in search of a worthwhile problem to solve; and  $\dot{R} \rightarrow ? \rightarrow \dot{G}$ , a totally undefined opportunity.

Without conscious situation analysis, problems tend to be chosen in roughly the order presented here. First, we do tasks; then we tackle defined problems. Unstructured problems are less likely to be chosen for attention, and structured and unstructured opportunities often are never recognized. This "natural" approach to choosing problems in situations is biased toward short-term survival in the immediate situation, since urgent problems, almost by definition, have clear realities and states to be desired or avoided. This approach is most appropriate for lower-level jobs in organizations where the time span of discretion is short and tasks are well defined (Jaques, 1979). At higher management levels, as the time span of discretion increases and tasks become less structured, the natural approach becomes less effective. Successful long-term adaptation in organizations, particularly in environments that are turbulent and rapidly changing, requires a process of careful strategic choice of the right problem to work on that resists "knee jerk" reactions to symptomatic environmental pressures. Urgent structured problems in organizations are often the result of failure to address unstructured problems that lie behind them; for example, the continued urgent need to replace bank tellers may result from failure to address more unstructured problems of worker morale or career opportunities. In addition, for many organizations in rapidly changing environments, aggressive opportunity seeking is essential to maintain stability and growth. Careful situation analysis is therefore most critical when long-term adaptation to a changing environment takes precedence over expedient action.

The dialectics of situation analysis involve the successive articulation of possible goal states ( $G$ ) and the exploration of current realities ( $R$ ) in order to create a menu of problems and opportunities in the situation, from which one can be chosen that satisfies the criteria of urgency and importance. The process of articulating desired goal states is the process of valuing.

Valuing is an intentional process focused on the affective meaning of goal statements. The affective component of goals

and objectives is their “energy core,” that part of a goal that stimulates, focuses, and channels human energy. Surrounding this core is usually a conceptual or symbolic component of goals that relates them to the current situational realities. An automotive assembly unit, for example, may have a goal of reducing quality control rejects from the paint room from 5 percent to 2 percent. This statement reflects only the symbolic component of the goal. The affective component is unexpressed. Possibly it is pride in one’s work, fear of losing one’s job because of foreign competition, reluctant obedience to an order from above, or some combination of these emotional values. Although the affective core of goals and objectives is typically latent, it is the summative impact of these emotional values that determines the actual importance of a goal.

The task of the valuing phase of situation analysis is to identify and articulate these often-latent emotional values, for it is these values that are stimulating and channeling human energy in the situation. To be successful, the valuing process must overcome barriers that exist in most organizational settings to open sharing of values. Foremost among these barriers is the organizational press to be realistic. George Prince, one of the developers of synectics, describes the following dialogue with one of his friends about wishing (a technique for valuing):

I asked a business friend to explain to me why he found wishing difficult and distasteful. “I have spent my adult life doing my best to be realistic and deal with situations the way they really are, not the way I wish they were,” he said.

“If you don’t wish about a situation, how do you know how it ought to be?” I asked.

“You have a point, but I do not call that wishing. I call that having a goal or objective—it is not a wish, it is something it is possible to achieve. Wishing, by my definition, is hoping for something to happen that you *know* can’t happen,” he replied.

It is understandable that practical people have trouble tolerating wishfulness. However, I see wishing as an additional form of exploratory thinking, of goal setting. Because it is not concerned



with reality, it has the capacity for opening one's eyes to new possibilities. If one is constantly realistic and precise in wanting (goal setting), one automatically rules out exploring many lines of thought that might be profitable [Prince, 1975, p. 171].

Wishing, wanting, and valuing must be explored independent of reality in order to develop fully. In dialectic terms, the thesis of value must first be fully articulated before facing the antithesis of reality from which the synthesis of a chosen problem can be developed.

Two other barriers to the valuing process are the fear of conflict and the threat of isolation. Charles Lindblom (1959) noted some time ago that it is easier to find agreement on a course of action than to get agreement on the goals for the action. Discussion of values accentuates human individuality and emotional commitment, with a resulting increase in conflict among viewpoints. In the dialectic view, such conflict is essential for the discovery of truth, although most executives shy away from conflict because it is unpleasant and because they do not know how to use disagreement constructively. A related barrier to valuing is the threat of isolation that comes from holding values different from the majority's. It is this barrier that gives rise to conformity and groupthink (Janis, 1971) in problem finding. A worker, for example, may suppress his or her genuine values for achievement and excellence in order not to violate group norms of mediocrity. For this reason an effective valuing process requires an environment that gives security and support for individuality.

The contrasting pole to valuing in the situation-analysis dialectic is priority setting. Priority setting is an extensional process concerned with actively shaping concrete reality by choosing areas to be changed and improved. As with any dialectic, valuing and priority setting enhance each other—valuing gives direction and energy to priority setting, and priority setting gives substance and reality to valuing. Priority setting has three specific tasks: (1) to explore the current situation for features that facilitate or hinder goal achievement, (2) to test the feasibility



of changing those features, and (3) to articulate reality-based goal statements that give substance to values and allow them to be realized. Priority setting is not a rational, analytic process of reflective planning. It is an active, intuitive process of trial-and-error exploration of what is going on in the situation. It involves "knocking on doors," listening to people, trying things out, and taking risks.

Overall, the central issue in situation analysis is leadership, and the basic social role of the problem manager is that of a leader whose responsibility is to guide the problem-solving attention of the organization to those problems and opportunities whose solution will be of maximum benefit to the long-run effectiveness of the organization. Someone once said that the key to successful leadership is to find out which way people are going and then run out in front of them. There is an element of truth in this, for the successful leader in situation analysis identifies the values and goals of those in the situation and then holds up those that are most important as priorities for action.

*Problem Analysis—Information Gathering and Problem Definition.* Problem analysis begins with the problem chosen in situation analysis and seeks to understand and define the problem in such a way that solutions can be developed. Problem analysis is an intentional process that focuses on determining the meaning of a problem by determining the critical attributes that make it up. This determination of meaning is achieved through resolution of the grasping dialectics of apprehension and comprehension.

In the apprehension mode, information about the concrete problem situation is gathered. Knowledge of the specific problem situation is critical to problem solving because, as Dunckner notes, "we find that a solution always consists in a variation of some critical element of the situation. . . . Thus every solution takes place so to speak on the concrete specific substratum of its problem situation. . . . This is as important as it seems to be banal. For it follows from this that in seeking a solution, one must bring the given problem situation as clearly as possible into focus" (1945, p. 20).

receptive, open-minded phase in which all information associated with the problem is sought and accepted. This receptive stance has both a cognitive and an interpersonal component. Cognitively, it is important in the information-gathering phase to avoid biases and preconceptions about the nature of the problem and its causes in favor of letting the data about the problem speak for themselves. Interpersonally, information gathering requires skills in the development of trusting relationships so that others do not hold back or modify information to say “what the boss wants to hear” or to avoid reprisals. In many organizations the cognitive and interpersonal components of information gathering interact negatively with each other to produce a climate where gathering accurate information is very difficult. Mistrust and threat cause workers to withhold information, and management must therefore rely on its own prejudices about the nature of problems. By acting on these prejudices, managers reinforce worker mistrust and perpetuate a cycle that restricts accurate information exchange.

In the comprehension mode, problem definition, the task is to define the problem on the basis of the information gathered. Problem definition is basically a process of building a model portraying how the problem works—factors that cause the problem, factors that influence its manifestation, and factors mediating the application of solutions. Two skills are critical in building a model that defines a problem—causal analysis and imagery. Causal analysis uses the inductive logic of experimental inquiry to evaluate data in order to identify the invariant causal relationships that define the problem, thus sorting relevant from irrelevant information. Its principles, articulated long ago by J. S. Mill, are useful, though not definitive, heuristics for evaluating information in problem definition:

1. The method of agreement—nothing can be the cause of a problem that is not a common circumstance in all occurrences of the problem.
2. The method of differences—nothing can be the cause of a problem if the problem does not occur when the supposed cause does.

3. The method of concomitant variation—a supposed cause of a problem is not causally related to the problem if the two do not vary together.
4. The method of residues—take away from a problem those parts known to be the effects of other causes, and the remainder is the effect of the remaining causes.

Use of these principles serves as an evaluation filter to eliminate irrelevant information and to suggest hypotheses about the causes of the problem. For many problems, however, this evaluation alone is not sufficient to understand the complex dynamics involved. Imaging is a way to further refine the problem definition by imagining its dynamics and subjecting them to "thought experiments." Stated simply, imaging is the process of creating in one's mind, on paper, or by computer a model or scenario of how the problem occurs and then subjecting that model to various transformations to understand how the model operates and how the problem might be solved. Prince (1975, p. 168) describes this process nicely: "Imaging is our most important thinking skill because it accompanies and facilitates all other thinking operations. I find it useful to think of my imaging as my display system or readout of my thinking processes."

With practice, imaging can create richly detailed problem scenarios and can portray large amounts of information in complex interrelationships. Most important, these images can be manipulated and transformed at will. Duncker (1945, pp. 20-21) describes the details of such transformational thinking:

We can therefore say that insistent analysis of the situation, especially the endeavor to vary appropriate elements meaningfully *sub-specie* of the goal, must belong to the essential nature of a solution through thinking. We may call such relatively general procedures heuristic methods of thinking.

The inquiry after elements which should be varied in a suitable fashion is identical with the question "Just why doesn't it work?" or "What is the ground of the trouble (the conflict)?" . . . To each solution corresponds a ground of conflict



present in the situation analysis of the situation, therefore primarily an analysis of conflict . . . that seeks to penetrate more deeply into the nature, into the grounds of the conflict. . . . Besides elements which in the solution undergo elimination or alteration (so-called conflict elements), these are also areas which are actually used by the solution (material elements) . . . which answer the question "What can I use?" Analysis of the problem situation appears therefore in two forms: as analysis of conflict and as analysis of material.

Information gathered through apprehension of a concrete problem, when juxtaposed against a conceptual model of the problem, serves to evaluate that model, while the model created serves to guide the search for new relevant information. In a sense the problem manager in problem analysis is in the role of detective—gathering clues and information about how the "crime" was committed, organizing these clues into a scenario of "who done it," and using that scenario to gather more information to prove or disprove the original hunch. The dialectic between information gathering and the problem definition has a synergetic power over information or model alone, since in their combination one can learn from what does not occur or has not happened as well as from what has. As in Sherlock Holmes' famous case "The Dog Who Didn't Bark," a model suggests events that should occur if the model is true, and their nonoccurrence in reality can therefore invalidate the model. The output of the problem-analysis phase is a model of the problem validated through the interplay of information gathering and problem definition—a problem as defined. The problem as defined describes the problem in terms of those essential variables that need to be managed in order to solve it.

#### *Solution Analysis—Idea Getting and Decision Making.*

Solution analysis is a symbolic, conceptual activity based on the process of comprehension. Comprehension of solutions to the problem as defined is achieved through the interplay between intention—the development of ideas about how the problem can be solved—and extension—decision making about the feasibility of ideas generated. This two-stage process has been highly devel-

oped in brainstorming (Osborn, 1953). The first step of solution analysis focuses on creative imagination. This is the green-light stage of brainstorming, whose aim is to generate as wide a range of potential solutions as possible in an atmosphere free from evaluation and supportive of all ideas. The second substage, the red-light stage of brainstorming, focuses on evaluation—sorting through the ideas generated in the first substage and evaluating them systematically against the criteria that need to be met in order for a potential solution to most effectively solve the problem. In the solution phase, the problem solver is in the role of inventor, creatively searching for ideas and then carefully evaluating them against feasibility criteria.

*Implementation Analysis—Participation and Planning.* Implementation analysis is an extensional process aimed at carrying out abstract solutions in concrete reality. It is accomplished through the interplay of comprehension in the planning process and apprehension in the process of carrying out plans. Because implementation of solutions in organizational settings is most often done by or with other people, the critical apprehension task is participation, enlisting the appropriate involvement of those actors in the situation who are essential to carrying out the problem solution. Three subtasks are involved here:

1. Anticipation of the consequences that will result from implementing the solution and involvement of those who will experience these consequences in the development of ways to deal with them.
2. Identification of those key persons who, by virtue of expertise and/or motivation, are best qualified to carry out the various tasks in implementation.
3. Involvement of key persons in another cycle through the problem-solving process to reevaluate whether the most important problem has been chosen, whether the problem is properly defined, and whether the best solution has been identified. This step sometimes becomes necessary in the process of accomplishing (1) and (2) above.

In the participation phase of implementation, the essential attitude to adopt is inclusion of others, receptivity, and openness to their concerns and ideas.

The planning phase of implementation analysis is an analytic process involving the definition of tasks to be accomplished in implementing the solution, the assignment of responsibility to qualified persons, setting of deadlines, and planning for follow-up monitoring and evaluation of the implementation process. If the problem and its solution are very complex, planning may be quite complicated, using network planning methods such as PERT or critical path analysis. Often, however, a simple chart listing key tasks, responsible persons, and time deadlines is sufficient for planning and monitoring implementation.

Implementation analysis involves two dialectically related processes. The first is to develop plans for implementation and the concrete apprehension of the potential consequences of implementing these plans. An iterative process is often useful here—scout out potential issues that may arise in implementation, develop a rough plan, share it with those involved in the situation to get reactions, and then modify the plan. The other dialectic can be termed the “Whos and the Whats.” Executives appear to have distinct stylistic preferences about how they deal with this issue. Some prefer to define the “Whats” first—the plan and tasks to be accomplished—and then assign these tasks to persons to carry them out. Others begin with the “Whos,” first identifying qualified and interested persons and then developing plans with them. The best approach to take probably varies with the situation and task, but beginning with the “Whos” has the advantages of giving priority to often-scarce human resources and maximizing participation and delegation. In synthesizing these dialectics, the problem solver in implementation analysis adopts the role of coordinator working to accomplish tasks with other people.

#### Mind Sets and the Mental Discipline of Problem Management

Some systems for practical problem solving (such as that of Kepner and Trego, 1965) present a logical and somewhat mechanical step-by-step procedure for solving problems. Other approaches emphasize the mystery and emergent quality of the



process. Bruner (1962a), for example, sees the creative process as emerging from dialectically opposed orientations—detachment and commitment, passion and decorum, deferral and immediacy, and freedom to be dominated by the object and by one's inquiry. In the problem-management model presented here, it is not appropriate to view the steps as a rigid, invariant sequence, for three reasons. First, it is not practical for a manager to subject every problem that comes up to a thorough examination in the four analysis stages. Second, depending on one's role responsibilities and the nature of the particular problem one faces, different facets of the problem-solving process will be more critical than others. Sometimes, for example, the problem has already been solved when it reaches your desk; your task is to implement the solution, not to solve it again, re-define it, or choose another problem in the situation. Thus, the critical analytic stage for this problem is implementation analysis. Attention is given to the stages of situation analysis, problem analysis, and solution analysis only for review and evaluation purposes. Similarly, in some problems the critical, evaluative component is most important—for example, the instrument checkout before a flight—while in others the creative, imaginative component is central. Third, as anyone who has observed problem solving in action can attest, there *is* a nonrational, intuitive, mysterious component in human problem-solving behavior. New ideas pop up in the evaluation stage, important facts get remembered after the problem is defined, and so on. Too rigid adherence to a mechanical step-by-step process denies the benefits of these flashes of inspiration. However, to simply stand in awe of the mysteries of intuition and creativity is of little practical value.

The approach taken here seeks a middle ground between these two extremes by introducing the concept of mind sets into the problem-solving process. Mind sets are higher-level mental heuristics or thinking styles that guide the direction and focus of the problem-management process. Through conscious choice of the appropriate mind set and management of the transitions and interrelationships among mind sets in the stages of problem management, it is possible to increase problem-solving

effectiveness. The mental discipline of problem solving involves learning how, first of all, to be aware of the mind set we and others are using in working on a problem and, then, how to consciously adopt the appropriate mind set for the particular issue at hand. Thus, problem solving is the process of using our minds to control the world around us. It is literally the way we achieve the power of mind over matter.

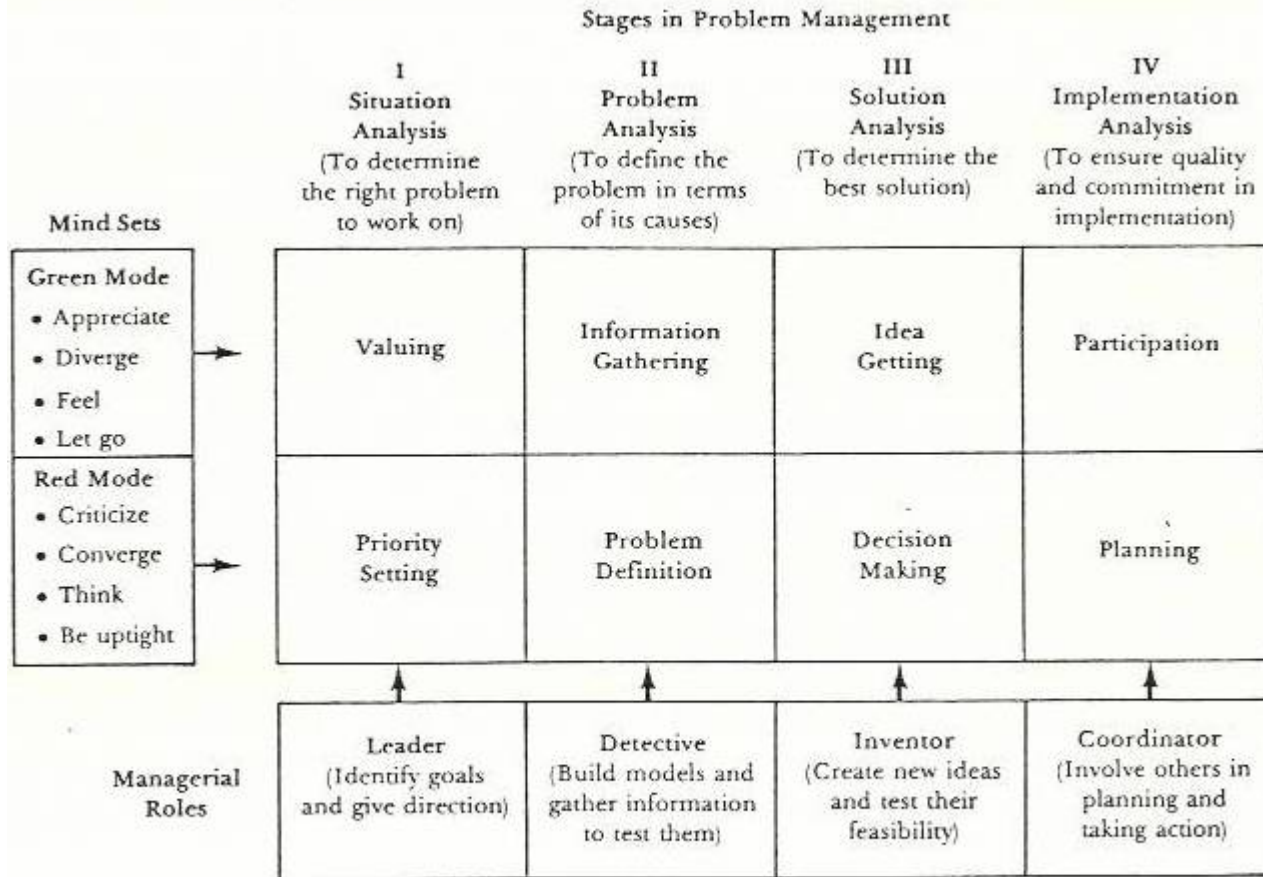
There are two physiologically based mind sets, called "red mode" and "green mode" in deference to their similarity to the red-light and green-light phases of brainstorming, and four role-based mind sets that correspond to the four analytic stages of problem solving (see Figure 4).

The red- and green-mode mind sets correspond to the two predominant orientations of consciousness identified by Hilgard (1979) in his review of psychological research on human consciousness. Dickman (1971, p. 481) describes the physiological and psychological characteristics of these two orientations:

The action mode [red mode] is a state organized to manipulate the environment. The striate muscle system and the sympathetic nervous system are the dominant physiological agencies. The EEG shows beta waves and baseline muscle tension is increased. The principal psychological manifestations of this state are focal attention, object-based logic, heightened boundary perception, and the dominance of formal characteristics over the sensory; shapes and meanings have a preference over colors and textures. The action mode is a state of striving, oriented toward achieving personal goals that range from nutrition to defense to obtaining social rewards, plus a variety of symbolic and sensual pleasures, as well as the avoidance of a comparable variety of pain.

The attributes of the action mode develop as the human organism interacts with its environment. For example, very early in life focusing attention is associated not only with the use of the intrinsic muscles of the eyes but also becomes associated with muscle movements of the neck, head, and body, whereby visual interest is directed toward

Figure 4. Managerial Mind Sets and Roles in Problem Management.





objects. Likewise, thinking develops in conjunction with the perception and manipulation of objects and, because of this, object-oriented thought becomes intimately associated with the striate muscle effort of voluntary activity, particularly eye muscle activity. Specific qualities of perception, such as sharp boundaries, become key features of the mode because sharp boundaries are important for the perception and manipulation of objects and for acquiring knowledge of the mechanical properties of objects. Sharp perceptual boundaries are matched by sharp conceptual boundaries, for success in acting on the world requires a clear sense of self-object difference. Thus, a variety of physiological and psychological processes develop together to form an organismic mode, a multidimensional unity adapted to the requirements of manipulating the environment. . . .

In contrast, the receptive mode [green mode] is a state organized around intake of the environment rather than manipulation. The sensory-perceptual system is the dominant agency rather than the muscle system, and parasympathetic functions tend to be most prominent. The EEG tends toward alpha waves and baseline muscle tension is decreased. Other attributes of the receptive mode are diffuse attending, paralogical thought processes, decreased boundary perception, and the dominance of the sensory over the formal.

These mind sets are not analytically independent processes, as were the learning processes identified earlier, but are pragmatic, holistic orientations that people adopt to cope with their environment. The red-mode mind set facilitates analysis, criticism, logical thinking, and active coping with the external environment. The green-mode mind set facilitates creative imagination, sensitivity to the immediate situation, and empathy with other people. The red-mode mind set is therefore most appropriate for the contraction phases of problem management—priority setting in situation analysis, problem definition in problem analysis, decision making in solution analysis, and planning in implementation analysis. The green-mode mind set, in

contrast, facilitates the expansion phases of problem management—valuing, information gathering, idea getting, and participation. Effectiveness in problem solving is enhanced by approaching the expansion/contraction phases of each problem-management stage in the appropriate mind set. For problem solvers to accomplish this matching of mind set and problem-solving task, they must first become aware of when they are in the red or green mode of consciousness and then learn to shift from one mode to another. With some practice this can be accomplished quite easily, and usually practice in identifying and separating the two mind sets has the effect of increasing the intensity of both. This purity of conscious mind set increases problem-management effectiveness by enhancing the dialectics of each analytical stage. Similarly, managing the problem-solving process with groups of people requires the creation of a climate that stimulates and reinforces the appropriate mind set in participants.

The problem-management process is further guided by four managerial role sets that focus the dialectic interplay of red and green mind sets on the relevant stage of the problem-management process. In situation analysis this role set is that of a leader focused on identifying goals and values in the situation in the green mode and setting priorities in the red mode. In problem analysis the role set is that of a detective focused on gathering information in the green mode and building and evaluating models in the red mode. In solution analysis the role set is inventor: generating ideas in the green mode and testing their feasibility in the red mode. In implementation analysis the role set is coordinator: developing participation in the green mode and planning in the red mode. Conscious attention to these role sets serves to focus attention on the priorities of each analytic stage, and shifting role set signals the transition from one stage to another.

### Problem Solving as a Social Process

How does the mind of the executive differ from the minds of other adults? What most distinguishes the way executives think and solve problems is the particular social system

they live and work in. Executives' minds are shaped by their organizations and their positions in them—by the values, norms, and climate created there and the mind sets that are rewarded. Managers with whom we have shared the problem-management model described above are quick to realize that their organizations have a strong influence on their personal problem-management process. Typical comments are “I often know I’m working on the wrong problem, but my boss has defined the situation for me and won’t listen to my views” and “I realize I operate too much in the critical red mode, but that’s the way my organization is.”

*Organizational Structure and the Managerial Role.* Organizations as a whole are problem-solving systems, and the structure of the organization is a problem-solving heuristic—it provides a way of defining and sorting problems and matching them with predetermined solutions. This can perhaps best be illustrated by comparing the typical organizational structure with the “family tree,” or branching structure, of an individual problem-solving process. It was the German psychologist Karl Duncker, in his seminal monograph “On Problem Solving” (1945), who first noted that individual problem-solving protocols could be ordered in a series of successively more concrete statements that reformulate the problem in such a way that each statement “in retrospect possesses the character of a solution and in prospect that of a problem” (p. 9). Figure 5 shows this successive ordering of problem-solving statements for his classic problem—how to treat an internal stomach tumor by x ray without destroying the healthy tissue surrounding it. This particular protocol shows the attempt to define three alternative approaches at the first problem-definition level—avoiding contact between the rays and healthy tissue, desensitizing the healthy tissue, and lowering the intensity of the rays on their way through the healthy tissue. These statements then branch into one or two levels of more specific solutions. The most feasible solution in this problem—use of a lens to focus the rays most intensely on the tumor—comes by way of the third branch of initial problem definition. Thus, attempts to solve this problem that begin with the third branch reach the solution more quickly than those choosing the first two branches. Pursuit of



the first two lines of thought, in fact, takes the problem solver further from the solution.

The visual analogy between the branching protocol and an organization chart is obvious, and in function the branching process is the same: Problems are stated most generally and abstractly in a mission statement at the top of the organization and are subdivided into specialized divisions, departments, and sections that concretize the mission statement in different ways—finance, marketing, production, and so on. At each successive level of the organization, the task is to assign a given problem to that branch below it that represents the best solution path—for example, to treat a particular case as a production problem or a marketing problem. The organizational structure thus serves to predefine problems for managers who occupy roles at these different levels—a process which can be efficient but whose effectiveness depends on properly defining and sorting problems at higher organizational levels, a task that is quite difficult in uncertain and rapidly changing environments. This constricting of the range of a manager's problem-definition process serves to reinforce a native human tendency to define problems too concretely. As Duncker states: "In very many cases the mediating phases (of problem definition) are not mentioned because the [subject] simply does not realize that he has already modified the original demand of the problem. The thing seems to him so self-evident that he does not have at all the feeling of having already taken a step forward. This can go so far that [he] deprives himself of freedom of movement to a dangerous degree. By substituting a much narrower problem for the original, he will therefore remain in the framework of this narrower problem just because he confuses it with the original" (1945, p. 11).

The tendency for executives to define problems narrowly in terms of their organizational role is illustrated dramatically in Dearborn and Simon's (1958) study of how executives from different organizational functions defined the most important problems facing the Castengo Steel Company. In analyzing this complex, detailed case describing the company's situation, sales managers described sales as the most important problem facing the company significantly more often than managers from other

functions. Production executives, in contrast, saw organization problems as more important, and managers from other functions also tended to see the company's problems in the light of their organizational roles.

Because executive problem management takes place in an organizational structure, problem solving involves not only cognitive analysis but interpersonal communication and influence. Effective situation analysis, for example, often involves a process of upward influence with one's superiors, challenging and exploring the choice of problem on the basis of what is often a more detailed and intricate knowledge of the problem situation at lower levels of the organization. Similarly, effective problem definition can require integrated communication and negotiation with peers in other functional specialties to determine which specialized resources should be allocated to deal with the problem.

*The Red-Mode Climate of Organizations.* A second social factor that conditions executive problem management is the tendency for most organizations to emphasize and reward the red-mode mind set over the green-mode mind set. Organizations have a tendency to become arthritic and constricted in their problem-solving processes because of forces that combine to emphasize criticism, evaluation, and avoidance of risk at the cost of positive appreciation, creativity, and exploration. Chief among these factors is the tendency to manage by exception, to attend to issues only when something goes wrong. This approach tends to emphasize problems at the expense of recognizing opportunities and reinforces a climate where managers avoid mistakes at all costs because the way to get ahead is to look good and avoid being the focus of executive scrutiny. Critical and analytical remarks dominate in this climate, since the emphasis is on spotting mistakes and deviations from normal procedure. In addition, it is easier and safer to be critical than to be creative.

George Prince (1972, p. 47) describes the impact of what he calls the judgmental (red mode) managerial style and then describes how the introduction of a climate that emphasizes the green-mode mind set can improve problem-solving productivity:

If you could watch and listen to video and sound tapes of business meetings, you would note the pervasiveness of the judgmental managerial style in corporate life. In watching and listening to hundreds of these tapes over many years, I have been impressed again and again by these observations.

- Even mild rejection has a significant negative effect on people.
- Pointing out flaws in the ideas and actions of others occupies much of the time.
- Approval has a positive effect on people and creates a climate for resolution of the problem....

The beginning of improvement in conditions comes when the manager recognizes that for productivity's sake, at least, he must avoid transactions between individuals that arouse defensive or revengeful reactions. Instead he must establish a climate in which it is appropriate to voice imperfect thoughts and ideas. In this climate all ideas are explored and used by the group. Flaws are dealt with, but as drawbacks to be overcome by everyone.

In my experience, when this climate is present, rejections, unfriendly queries, and pointing-out-a-flaw behavior are practically eliminated. Idea production rises dramatically. Every idea is noted and explored to some extent. According to the participants, they often come out of these meetings feeling exhilarated, pleased with having made worthwhile contributions, and sometimes even personally enriched.

*Conflict Management: Dialectics and Dialogue.* In the dialectic problem-management model proposed here, conflict is essential; it is the spark that ignites problem solving and the energy source that stimulates the generation and refinement of ideas. Typical organizational attitudes toward conflict are quite different, however. Table 2 describes some of the differences between typical organizational attitudes about conflict and problem solving and the stance toward conflict that is inherent in dialectic problem solving.



Table 2. Differences Between Typical Organizational Attitudes  
Toward Conflict and the Dialectic Attitude.

| <i>Feature of<br/>Conflict</i>            | <i>Typical<br/>Organizational<br/>Attitude</i>                     | <i>Dialectic<br/>Attitude</i>   |
|---|--|---|
| Centrality of conflict in problem solving | An undesirable side effect of problem solving                      | Essential to the process of problem solving   |
| Source of conflict                        | Conflict is between persons; pride is at stake                     | Conflict is in the problem situation; actors are observers and representatives  |
| Assumptions about outcomes                | I am right and you are wrong; the outcome is likely to be win/lose | We are both probably right and wrong; an integrated win/win solution can result   |
| How to handle conflict                    | Decrease intensity by avoidance, forcing, smoothing, or compromise | Keep at moderate intensity—"hot" enough to flush out assumptions and critical elements but "cool" enough to maintain an analytic stance |

Effective dialectical problem management requires a new set of attitudes and organizational norms about conflict management. Executives need to learn to use conflict constructively and avoid the ego-involved and personalized stances toward conflict that cause great personal stress and thereby result in strategies to avoid or suppress disagreement. Paulo Freire, whose revolutionary approach to experiential learning is based on dialectic problem solving, recommends dialogue as the appropriate social process for problem management:

Dialogue is the encounter between men mediated by the world in order to name the world. . . . And since dialogue is the encounter in which the united reflection and action of the dialoguers are addressed to the world which is to be transformed and humanized, this dialogue cannot be reduced to

other, nor can it become a simple exchange of ideas to be consumed by the discussants. Nor yet is it a hostile, polemical argument between men who are committed neither to the naming of the world, nor to the search for truth, but rather to the imposition of their own truth. . . . Founding itself upon love, humility, and faith, dialogue becomes a horizontal relationship of which mutual trust between dialoguers is the logical consequence. . . . Nor yet can dialogue exist without hope. . . . Finally, true dialogue cannot exist unless the dialoguers engage in critical thinking—thinking which discerns an indivisible solidarity between the world and men and admits of no dichotomy between them—thinking which perceives reality as process, as transformation, rather than as a static entity—thinking which does not separate itself from action, but constantly immerses itself in temporality without fear of the risks involved [1974, pp. 76–81].

#### Summary

This chapter has described a dialectical model of problem management based on the theory of experiential learning. The model identifies four analytic stages in problem management—situation analysis, problem analysis, solution analysis, and implementation analysis. Within each stage, analysis is based on dialectically opposed phases—valuing and priority setting in situation analysis, information gathering and problem definition in problem analysis, idea getting and decision making in solution analysis, and participation and planning in implementation analysis. Problem management involves adopting the appropriate cognitive mind set for each stage and phase. Problem solving is both a cognitive and a social process. Social factors that can facilitate or hinder effective problem-solving management are the organization's structure and an executive's role in it, the extent to which the organization emphasizes the red-mode or green-mode mind set, and the way conflict is used in problem management.

