12

Managing the Creative Process in Organizations

Min Basadur

This chapter discusses how creative behavior can be increased and managed in organizations. Variables associated with nurturing creative activity are identified. The chapter first presents a theoretical model of organizational creativity, and then discusses empirical research on the model as it is applied. Finally, the chapter discusses future applications and tests of the model.

THE BASIC MODEL

Organizational creative behavior can be defined as a three-stage process of problem-finding, problem-solving, and solution implementation activity. This process is identified as a complete process of creative problem solving. What is meant by a complete process of creative problem solving is that it is based on two central, fundamental concepts. First, it has distinct stages. It separates problem finding from problem solving and solution implementation. The second important feature of the process is that within each of the three critical stages, there is a common, fundamental, miniprocess. This is a sequential two-step thinking process called *ideation-evaluation*. *Ideation* is defined as idea generation without evaluation (putting aside the judgment capability). This is the diverging aspect of the two-step process. *Evaluation* is the reverse. It is defined as the application

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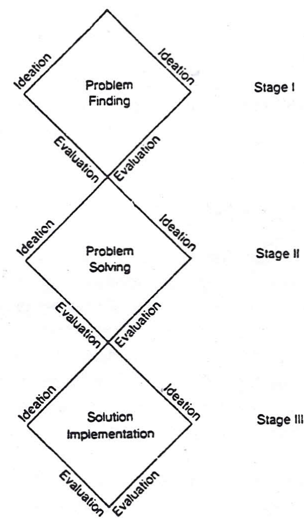
of judgment to the generated ideas to select the best one(s). This is the converging aspect of the two-step process. Both aspects are believed essential to creativity (Farnham-Diggory, 1972).

Most researchers in creativity agree that evaluation is an important aspect of the creative process, and that there are stages to the creative process above and beyond simply finding solutions to already identified problems. There is increasing discussion that *finding* new and useful *problems* to solve is a separate and more important stage of the creative process than finding useful *solutions* to already identified problems (Getzels, 1975; Mackworth, 1965). Einstein said that the mere formulation of a problem is often far more essential than its solution (which may be merely a matter of mathematical or experimental skill). Problem finding includes both of these aspects of (a) discovering problems to solve and (b) formulating them for subsequent solution. Other researchers emphasize solution *implementation* as another important stage of the creative process (Parnes, Noller, & Biondi, 1977).

The terms *creativity* and *creative problem solving* are used essentially interchangeably in this chapter. The three-stage process is depicted in Figure 12.1. In the rest of this chapter when reference is made to a "complete process of

Figure 12.1. A "Complete Creative Problem Solving Process" Emphasizing Ideation–Evaluation as a Two-Step Process in Each of Three Stages.

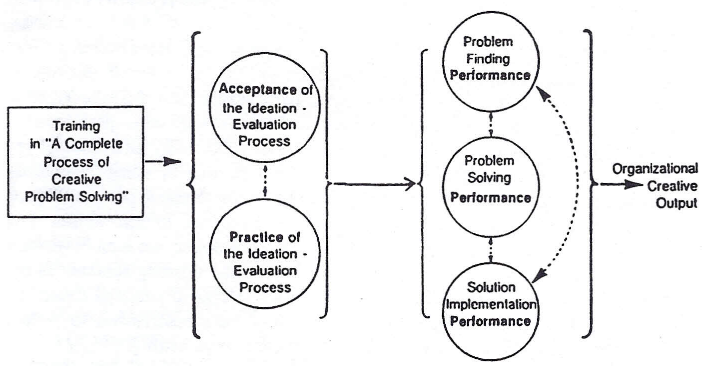


creative problem solving," what is meant is this three-stage process emphasizing the ideation-evaluation principle at each of the three stages: problem finding, problem solving, and solution implementation. All aspects of this chapter are based on this model of oscillating ideation–evaluation. Thus, the notion is that it is not sufficient to merely "solve" a problem creatively. Creativity must also be applied to the implementation of a solution and to the discovery of the problem in the first place. In other words, nothing creative has happened until something "gets done," and you must start somewhere—that is, create the problem to be solved. The model is elaborated on later in this chapter.

Empirical Research on the Model as it is Applied

Basadur, Graen, and Green (1982) reported an empirical test of the effects of training the complete process of creative problem solving in an applied setting. Basadur et al. expected that the training would have positive effects on five variables. Two of these were the antecedent variables of (a) acceptance of the ideation–evaluation process and (b) practice of the ideation–evaluation process. The other three were (c) problem-finding performance, (d) problem-solving performance, and (e) solution implementation performance. Basadur et al. suggested that the first two variables were necessary antecedents of the latter three performance variables, which in turn led to creative output. The expected training effects are modeled in Figure 12.2.

Figure 12.2. Expected Model for Training Individual Creative Behavior In An Organization.



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There were three premises underlying the training by Basadur et al. First, for most people the ideation step is more difficult than the evaluation step of the process. Our society, including school systems, tends to reward and hone our evaluation capabilities and preferences and promote their use virtually to the exclusion of ideation (MacKinnon, 1962, 1977; Osborn, 1963; Thurstone, 1950; Wallach, 1971). Over a period of time evaluation starts to dominate. For example, Altemeyer (1966) and Doktor (1970) found that engineering students are less able upon graduation to use their imagination than when they entered, 4 years earlier. Second, even within the above context, there are individual differences. People differ in their relative preferences, aptitudes, and abilities in the two steps of the ideation–evaluation process (Guilford, 1967; Kolb, 1976). Some people may be relatively better in ideation or in evaluation. Third, while the training is designed to strengthen both steps of the ideation–evaluation process, it is expected to have the most effect on that step of the ideation–evaluation process that is least developed in each trainee.

In Basadur et al.'s research, the organization from which the participants were drawn employed engineers, engineering managers, and technicians in an engineering department. It was a large consumer goods industrial company. The participants' jobs depended on creativity. Their organization requested the training to try to promote an increase in creative performance in applied research. The research was such that the experimental design and measures were meshed with organizational realities and needs. The placebo control intervention was desinged to be seen by all participants as merely part of the training intervention, and the measures were designed to be seen in some cases as actual pieces of the training itself, and as nonevaluative aids to developing future training in other cases.

The treatment consisted of two days of intensive training in the creative problem solving depicted in Figure 12.1. The training was primarily experiential and practice oriented. Training experiences included a series of diverse tasks that permitted and encouraged participants to attempt to discover concepts not considered before, such as ideation–evaluation and the value of both divergence and convergence in thinking. For example, participants individually defined a problem from a case and then compared definitions with other participants, discovering that the sample problem could be viewed in many different and yet fruitful ways. Another important aspect of the "learning by doing" emphasis was that the teachings and emerging skills in using the complete process (Figure 12.1) were also applied to real-world problems in addition to case studies. For example, each person generated an individual work problem and then developed a solution and implementation plan before leaving the training session. These processes encouraged transference of creativity concepts to personal frames of reference. Within the design, delayed measures were constructed to reflect behavioral changes transported back to the regular work setting.

There were three methods of measurement: questionnaire, tape recorder, and interview. Within the questionnaire method there were attitudinal self-reports, paper-and-pencil tasks designed to be relevant to the context of the participants' work, and observations of on-the-job behavior by other participants and supervisors. The interviews were conducted 2 weeks after return to work. Both open-ended and direct questions were asked in private confidential interviews with each participant. The interviews were tape recorded (to get a better record) with each participant's permission. The questions concerned their observations of on-the-job behavior of other participants and themselves.

The tape-recorder measure was a somewhat novel feature of this research. Each participant was provided with a tape recorder, sent to a private soundproof room, assured of complete confidentiality, and asked to do an ambiguous task of a problem-finding nature. Participants were also asked to verbalize everything they were thinking *during* this task, even their thoughts in between task-related ideas. In other words, they were asked to record all conscious thought during the task. The intent of this methodology was to tap the individuals' stream of conscious thought during a problem-finding task. The tape-recorded responses were later examined by independent judges who were blind to condition. Two judges, experienced in creativity training, were used to measure the practice of ideation–evaluation during problem finding and the quantity of problem-finding ideas. Two judges who were experienced product development managers were used to measure quality of problem-finding ideas. In each case, the two judges' scores were averaged for analysis.

Using this multiple method and measure approach, Basadur et al. obtained encouraging empirical data supporting the usefulness of such training. This was evident, not only immediately after the training, but also later, back on the job. Gains were made by participants on specific measures, such as "less likely to jump to conclusions as to what is the real problem"; "more open-minded to new ideas and approaches"; "more positive reaction to new, unusual product ideas"; "deferral of critical judgment"; "less time spent in negative evaluation during idea generation"; "higher quantity and quality of problem finding"; "increased number of different problem definitions developed prior to choosing one as best"; and "more likely to pause to try new, unusual approaches." An unexpected discovery of the research was that the two antecedent variables in Figure 12.2 turned out to be multidimensional rather than unidimensional.

The remainder of this chapter extends the model of Figure 12.2 to reflect the discovery of multidimensionality. Basadur et al. reported only empirical findings; the present chapter develops the conceptual implications. Both the empirical and conceptual findings draw heavily from Basadur's (1979) unpublished doctoral dissertation.

The remainder of this chapter also explains the exogenous organizational, group, and individual factors which may moderate the relationships in these models. Diverse but relevant research studies scattered throughout the organizational behavior and creativity literature are integrated to further extend the model. These incremental model extensions are intended to deepen our understanding of *how* such training actually works to increase creative problem-solving activity and what it takes for an organization to make such training a worthwhile intervention. Directions for new research initiatives are also provided.

An important argument in this chapter is that it may be possible to identify different ratios of ideation activity and evaluation activity that are optimal at each of the three stages of Figure 12.1. Empirical data underlying this possibility are described and conceptual models are offered. The groundwork for researching this possibility is given.

Literature Review

The ideation–evaluation process in Figures 12.1 and 12.2 can be summarized as the deliberate separation of imaginative, nonjudgmental, diverging thinking from nonimaginative, judgmental, converging thinking. The latter is delayed until the former has had an opportunity to be developed adequately. The emphasis is on doing both kinds of thinking, but separating the two. It is the deliberate use of both ideation and evaluation in a *skilled, planned, orderly way.*

Ideation–evaluation has been given many different names. Osborn (1963), Parnes and Meadow (1959, 1960), and Parnes et al. (1977) referred to it as the principle of *deferred judgment.* Prince (1970, 1976) advanced the notions of experimentation–safekeeping and irrelevance–precision. Gordon (1956) suggested *deferment* as being critical for speculation. Gordon's notion of deferment referred to the capacity to discard the "glittering immediate" in favor of a "shadowy but possibly richer future." Stein (1953) suggested the concept of "sensitivity to lack of closure" (p. 322), which he associated with the capacity to tolerate ambiguity. MacKinnon (1962) referred to "a balance of opposing attitudes or modes of thinking" (p. xiii).

Most creativity training approaches are based on some aspect of ideation–evaluation. Three of the most widely known approaches are simple brainstorming (Osborn, 1963), CPS processes (Basadur, 1982, 1987, 1992; Isaksen & Treffinger, 1985; Parnes et al., 1977; Treffinger, Tallman, & Isaksen, 1993), and Synectics (Gordon, 1971; Prince, 1970). Brainstorming is not a complete process. It is confined to the ideation half of stage II in Figure 12.1. In brainstorming, potential solutions are generated for a presented problem. CPS and Synectics processes are more complete. Both generally fit the whole model in Figure 12.1; however, CPS processes probably emphasize all three stages in a more balanced way than Synectics, which tends to emphasize stage II somewhat more than stages I and III.

Previous empirical data on the value of providing creativity training to managers and professionals, using real-world problems, were sparse and in disagreement in some respects and fragmentary in others. Two such studies are described in detail in this section. Both used "presented" problems. Neither measured attitudinal nor behavioral impact of the training or its transfer back to the workplace. The results of the studies are somewhat contradictory. In the first, Cohen, Whitmeyer, and Funk (1960) suggested that such training is useful in improving problem-solving performance *only* on real-world problems. Rickards (1975) disagreed, and suggested that such training is likely useful only on *non*-real-world problems. Rickards found that, on real-world problems, training leads to ideas which are only very similar to those produced without training. Rickards implied that the practice of ideation–evaluation on real-world problems may not be fruitful to try to bring about in managerial groups. He concluded that the lack of operational success may be the result of training procedures that are inadequate for repressing long-term beliefs and attitudes of the group members in real problem-solving situations. Such long term beliefs and attitudes are contrary to the ideation-evaluation thinking process. Thus, Rickards openly and rightfully questioned whether or not it is possible to change individuals' acceptance and practice of ideation–evaluation in the context of real-world work activity.

Further insight can be gained by comparing the two studies in more depth. A major difference between them was that Cohen et al. provided much more training (10 hours) than Rickards (about 1½ hours). Kraut (1976) suggested that, for training to be successful, it must induce a causal chain of changes in attitudes, behaviors, and results. One might speculate that Rickards did not provide sufficient training to "unfreeze and change" participants (Schein, 1961), whereas Cohen et al.'s training did. Perhaps Rickards's brief training did *not* really induce participants to accept or practice the ideation–evaluation process when confronted with a real-world problem. In contrast, perhaps Cohen et al. *did* induce their participants to accept and practice ideation–evaluation. In Basadur et al.'s (1982) research, 2 days (over 16 hours) of training were provided. The results showed this to be sufficient to make a real change in participants' attitudes, behaviors, and performance, and supported the model in Figure 12.2.

Several laboratory experiments also indicated that there are inhibiting influences in groups, which reduce the value of training (giving brainstorming instructions) compared to the value of the same training (giving brainstorming instructions) to individuals (Shaw, 1971; Taylor, Berry, & Block, 1958; Bouchard, 1972; Bouchard & Hare, 1977; Dunnette, Campbell, & Jaastad, 1963). Importantly, none of these experiments measured intermediate attitudinal or behavioral effects of giving such instructions. It is unlikely that simply giving brainstorming instructions qualifies as sufficient training to unfreeze and change participants, and it is very likely that the participants did not really "open up" in the groups to truly accept and *use* the brainstorming instructions. More likely they were inhibited by the presence of others and lacked sufficient attitudes and skills in the ideation–evaluation mechanism. These groups should be called *untrained groups, undertrained groups,* or *underdeveloped groups.* Unless trainees achieve significant increases in ideation–evaluation acceptance and skill, increases in creative performance should not be expected in individuals or interacting groups compared to untrained individuals or untrained or nominal groups. In other words, the processes modeled in Figures 12.1 and 12.2 strongly suggest that training in creative problem solving must be of sufficient quality, impact, and duration that *real* improvements are made in the acceptance of the validity of the skill of ideation–evaluation and in the skill itself.

Basadur et al. (1982) systematically measured for the first time the impact of creative problem-solving training on individuals both immediately after training and later after return to work. They expected that unless the antecedent variables—the acceptance and practice of the ideation–evaluation process—were impacted positively, neither would any of the three performance variables. These expectations are consistent with Kraut's (1976) traditional industrial/organizational psychology training model: Training must go beyond *understanding,* to change *attitudes,* to change *behaviors,* to achieve superior *results.* Basadur et al. (1982) stressed that essentially none of the research in creativity training had addressed the intermediate steps in Kraut's model. Their research attempted to measure and understand to what extent changes in acceptance of (attitude) and practice of (behavior) ideation–evaluation may *actually* result from training and accompany changes in performance (results). This link between training and actual changes in acceptance and practice of the fundamental ideation–evaluation process had simply been *assumed* to occur in previous research.

Even though brainstorming is a divergent thinking technique based on the *use* of ideation–evaluation, none of the brainstorming research above had attempted to measure to what extent the subjects actually *accepted* the value of and *used* ideation–evaluation during the brainstorming experiment or more permanently back in the real-world setting. To what extent brainstorming performance correlated with the willingness to accept ideation–evaluation and the skill in using it was never tested. In other words, in many of these earlier research studies, "giving brainstorming instructions" was all the training there was (as if this was sufficient to obtain sudden changes in brainstorming attitudes and behaviors). It is one thing to "nod your head" to say you *understand* brainstorming rules. It is an entirely different thing to *use* the brainstorming rules skillfully, especially on real world problems on issues that are important to the participants.

Basadur et al. (1982) extended the previous research in several other ways. One way was to try to understand problem *finding* and solution *implementation* as well as problem *solving.* (Virtually all previous organizational research had focused only on problem *solving.*) Another way was to focus primarily on effects and mechanisms concerning *individual* attitudes, behaviors, and performance in a real-world setting (rather than laboratory). That segment of the previous research which had occurred in relatively real-world settings was limited to *group* variables.

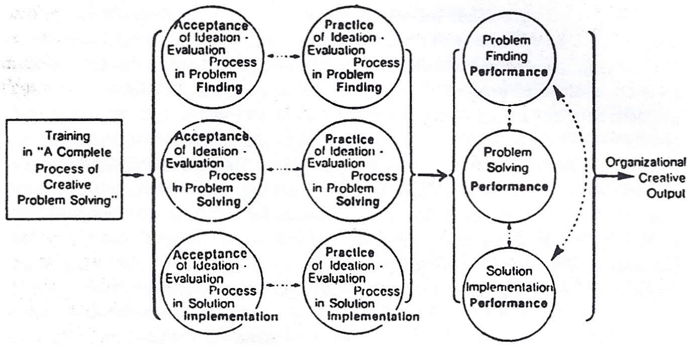
Thus, Figure 12.2 offers the starting point of a theoretical model to explain the mechanisms of training in creativity in organizations. This model postulates that training impact must be sufficient to increase acceptance and practice of the ideation–evaluation process if any meaningful increases in problem-finding, problem-solving, or solution implementation performance and organizational results are to have a chance of occurring. The model excludes exogenous factors which may intrude such as organizational, group, and other individual work-related factors. Potential interrelationships among the constructs for future research are indicated in dotted lines. The model is useful primarily for the identification of these key constructs which training must impact to be successful. The rest of this chapter builds upon this model, drawing from Basadur (1979), Basadur et al. (1982), and other diverse studies.

NEW DISCOVERIES AND EXOGENOUS MODERATING FACTORS

As mentioned above, one major discovery reported in Basadur et al.'s (1982) research was that both the variables of acceptance and practice of ideation–evaluation were multidimensional rather than single dimensional. This is different from what was expected from the model in Figure 12.2. Six new antecedent variables replaced the two antecedent variables in Figure 12.2. These were labeled (a) "acceptance of ideation–evaluation in problem *finding,*" (b) "acceptance of ideation–evaluation in problem *solving,*" (c) "acceptance of ideation–evaluation in solution *implementation,*" (d) "practice of ideation–evaluation in problem *finding,*" (e) "practice of ideation–evaluation in problem *solving,*" and (f) "practice of ideation–evaluation in solution *implementation.*" Because Basadur et al. (1982) confined their testing to the problem-finding and problem-solving aspects of Figure 12.1 (that is, the solution implementation aspects were beyond the scope of the experiment), only four of the six new variables were actually identified. The probable parallel existence of the other two was extrapolated to complete the new model. Thus, the discovery that the acceptance and practice of the ideation–evaluation process by an individual, group, or organization are likely each different for each of the three stages of the process in Figure 12.1 leads to the revised model of training effects shown in Figure 12.3. Figure 12.3 suggests that changes in acceptance of (attitude), and practice of (behavior), ideation–evaluation in each of problem-finding, problem-solving, and solution implementation are necessary antecedents to corresponding changes in performance.

The model in Figure 12.3 needs further refinement. It is well accepted in the organizational development literature that, for sustained behavior change back on

Figure 12.3. Revised Model For Training Individual Creative Behavior In An Organization.



the job, more than just one kind of intervention is needed. Beer (1980) suggests that training interventions can *unfreeze* and *change* people, but must be integrated with additional interventions to *refreeze* those changes and prevent "fade-out". Such additional interventions can be structural, process, diagnostic, or individual. The creativity literature contains training studies with results that can be reconciled directly with the prevention of fade-out. In addition, there is considerable literature concerning exogenous organizational, group, and individual variables totally unrelated to training, which are likely to impact creative behavior and the effects of training to improve creativity in organizational settings. Following is a review of the literature concerning such exogenous organizational, group, and individual variables.

Literature Review of Organizational Level Variables Moderating Creative Behavior

Research on organizational factors affecting individual creativity in R&D organizations was summarized by Baker, Winkofsky, Langmeyer, and Sweeney (1976). A large number of miscellaneous studies were reviewed. For example, Andrews and Farris (1972) showed that the innovation performance of scientists and engineers suffered if time pressure experienced was markedly above a desirable level. More recently, Amabile and Gryskiewicz (1989) developed and used an instrument to identify and measure factors in the work environment which impact creativity. Called the *Work Environment Inventory* (WEI), its purpose is to help organizations improve the climate for creativity. This section integrates these two parallel organizational-level research efforts.

The following four organizational factors affecting the creative process were categorized by Baker et al. (1976). The first was labeled *diversity of information*. This is comprised of frequency of contact with diverse colleagues, variety of work activity, and frequency of contacts with technological gatekeepers (meaning colleagues highly tuned in to external sources of technical information). Opportunities for diversity of information are enhanced by increased participation in extraorganizational professional activity, increased number of occupational specialties within the organization, decreased formalization or job structure, and increased participation in organizational decision making. As an aside, Cutler (1989) found that roughly 86% of Japanese researchers attend technical meetings outside their workplace at least twice per month, but the proportion is roughly only 30% for U.S. researchers. Attendance at international meetings in the previous 2 years was 59% in the Japanese case and only 28% in the U.S. case. Also, Japanese engineering researchers work in teams. The technology transfer mechanism is "people intensive," and people feel strong personal needs for face-to-face discussions. The superior product development performance of Japanese firms over their North American competitors in certain industries such as automobiles may reflect such differences in participation in diversity (Dertouzos, Lester, & Solow, 1989).

The second organizational factor identified by Baker et al. (1976) is called *organizational values* and *norms*. Organizational creativity is enhanced by increased *clarity* of organizational goals, objectives, needs, and opportunities; by appropriate incentive systems and time pressures; and by organization designs that appropriately balance freedom and direction. The remaining two factors identified are categorized as *flexibility of organizational resources* (the degree to which uncommitted resources are available for new opportunities) and *quality of supervisory behaviors* and *attitudes* (assisting as a collaborator and critic and influencing to insure availability of rewards, conditions, and resources condusive to creative performance).

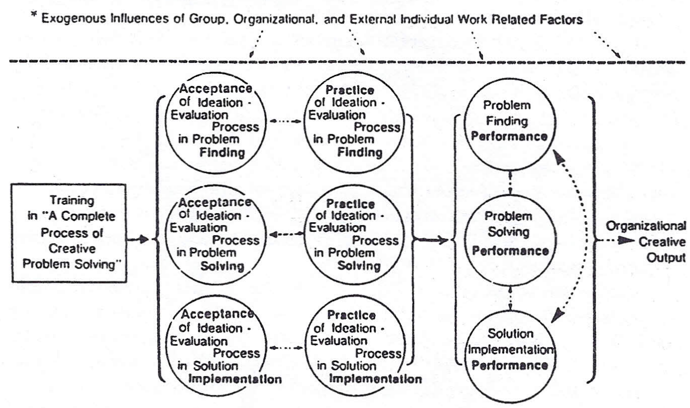
Amabile and Gryskiewicz (1989) suggested that individual creativity within an organization depends, in addition to the individual's own personal creative skills and motivations, on three basic factors of the organization's social environment. These are *skills in innovation management* (this overlaps all four categories above, and emphasizes skill at both the organizational and supervisory levels); the commitment to innovation at the organizational level (this could be called the *organizational motivation to innovate* and is consistent with the organizational values and norms factor above); and *resources in the task domain*, including materials, personnel, and time (this is similar to the flexibility of organizational resources factor above).

Group and Individual Level Variables Moderating Creative Behavior

An additional analysis of the real-world experiments by Cohen et al. (1960) and Rickards (1975), discussed above, provides further insights into the group influences inhibiting the usage of the ideation–evaluation thinking process. Cohen et al. found that training had a significant positive impact on performance only when individuals worked alone or with people in *cohesive* pairs, and not when they worked in *noncohesive* pairs. In contrast, there is no reason to believe any significant group cohesiveness existed in any of the groups formed by Rickards (1975). The test groups were all put together only for the purposes of the experiment, and many of the groups appear to have been composed of strangers. The difference in findings, then, is consistent with social psychology research, which has determined group cohesiveness as a major determinant of group performance.

There were also important differences between the two studies in terms of individual work-related factors, such as familiarity with and commitment to the field of work (or problem). Cohen et al. (1960) considered the effects of problem significance (ego involvement) and degree of problem familiarity to the

Figure 12.4. Further Revised Model For Training Individual Creative Behavior In An Organization.



*For example, Group Cohesiveness (at the Organizational and Work Team Levels); Diversity of Information; Organizational Values and Norms such as Time Pressures, Resources, Incentive Systems, Clarity of Objectives and Organizational Design Factors Balancing Freedom and Direction Appropriately; Organizational Motivation to Innovate; Skills in Innovation Management at Both Supervision and Organizational Levels; Individual Commitment to and Familiarity with the Work or Problem.

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subjects, whereas Rickards (1975) did not. When a problem of high interest and knowledge to all subjects was used by Cohen et al., positive results were achieved by the trained groups, and vice versa. Because each group problem addressed by Rickards was chosen by only "one or more" of the group participants, it is probable that the other group members were not very familiar with, or involved in, the problems. One can conclude that familiarity with, and commitment to, the problem and field of work are important mediating factors in training to increase creativity.

Revising the Starting Point Training Model

Figure 12.4 offers a revised theoretical model integrating and reconciling the above research, and using some speculation. This model postulates first that training impact must be sufficient to increase some combination of the six antecedent constructs of Figure 12.3 if any meaningful increases in organizational results are to occur. Second, certain exogenous organizational, group, and individual work-related factors that moderate the training must be managed. This model in Figure 12.4 identifies these factors and potential interrelationships among the variables.

OPTIMAL IDEATION–EVALUATION RATIOS

Basadur et al. (1982) suggested that an interesting line of research would be to explore the relative contributions of ideation and evaluation at each of the three stages of the process of Figure 12.1. For example, do these relative contributions differ by task or field of work? Perhaps in high pressure, high implementation-oriented jobs, the contribution of evaluation (convergence) is more important than ideation (divergence). Perhaps there are optimal ideation–evaluation ratios that differ by stage for any job or organization.

Before delving further into this concept, let us return momentarily to the discovery that acceptance of ideation–evaluation is likely multidimensional, as discussed earlier in this chapter. How this came about is described in Basadur (1979) and is summarized here. Nine different measures across two different methods of measurement were all expected to measure the single concept of acceptance of ideation–evaluation (see Figure 12.2). Factor analysis found them to be readily separable in two different sets of measures. One of these two sets dealt with preferences consistent with problem *solving* and the other with problem *finding*. The former set related more to preferences concerning a systematic use of ideation–evaluation in terms of a deferral of immediate closure or judgment in dealing with aspects of specific problem-*solving* situations. These measures included reactions to new solutions, to specific new product ideas, and to taking new approaches to problems; preferring a systematic, orderly, deciding, and planned process over a perceptive and spontaneous process in dealing with the outer world (judgment over perception); showing a willingness to look for optional ways of defining a specific problem; not jumping to conclusions as to what the real problem is; and the willingness to pause to try unusual and creative approaches to solve a specific problem.

On the other hand, the latter set of measures corresponded more to preferences concerning staying open, deferring closure, and using ideation–evaluation to look for possibilities in life in general (in other words, problem *finding*) rather than focusing on specific problem-solving situations. These measures included the tendency to perceive ambiguous situations as desirable; preferring a perception process that stresses looking for possibilities and relationships rather than working with known facts; and preference for a spontaneous, perceptive process over an orderly, deciding, and planned process of dealing with the outer world (perception over judgment). This latter set of measures is reminiscent of Stein's (1953) notion of sensitivity to lack of closure, mentioned above. Stein hypothesized a very early stage in the creative process wherein creative individuals are in tension, sensitive to gaps in their experience, and capable of maintaining and tolerating this state of affairs. Such individuals do not comprehend all that is going on during this time, but are able to tolerate the inherent ambiguity readily. Stein implied that, in the creative process, some of the ambiguity and lack of closure may become part of a complete creative process beginning with hypothesis creation (problem finding) in which the individual increasingly seeks to get closure (problem solving) on environmental gaps sensed earlier.

Hence, the two sets of measures were differentiated as representing two variables labeled "acceptance of ideation–evaluation in problem finding" and "acceptance of ideation–evaluation in problem solving,"respectively. An interesting aspect of this differentiation is that one of the above nine measures loaded significantly on both of the two factors but in opposite directions. It was assigned to each set. This measure was the Myers-Briggs PJ (*P*erception–*J*udgment) preference scale. The loading was positive (.63) on preference for ideation–evaluation in problem finding and negative (−.47) in preference for ideation–evaluation in problem solving. Thus, the measure "preference for perception over judgment" was assigned to the set labeled "acceptance of ideation–evaluation in problem finding" and the measure "preference for judgment over perception" was assigned to the set labeled "acceptance of ideation–evaluation in problem solving."

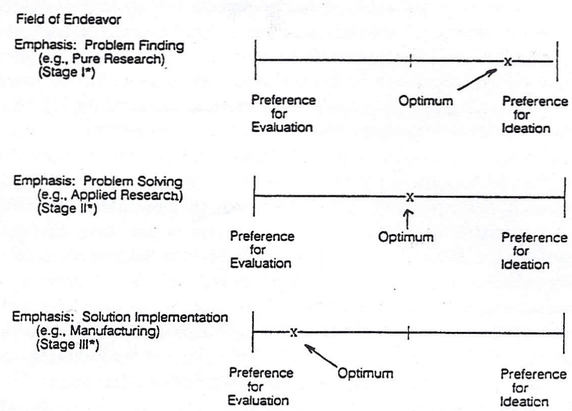
These opposite loadings of the preception–judgment measure on acceptance of ideation–evaluation in problem finding versus problem solving are quite provocative. The ideation–evaluation thinking process in no way implies a discarding of judgment. On the contrary, Figure 12.1 depicts a process in which judgmental and nonjudgmental thinking are coupled equally in a disciplined oscillating fashion throughout a multistage process leading to accomplishment. In an applied industrial environment, where activities are profit-oriented and time-limited frames for action exist, an increase in creative behavior would likely involve an increase in both ideation and evaluation skill. However, the need for a converging, judgmental (evaluational) attitude would likely be stronger on a day-to-day basis than for a diverging, perceptive (ideational) attitude. In contrast, in environments with less limited time frames for action, like pure research, perhaps one must favor being more diverging and perceptive (ideational) at the expense of being converging and judgmental (evaluational).

This is consistent with MacKinnon's (1962) finding that there are significant mean differences in *P* versus *J* balance across different fields of work among, at least, for individuals performing at higher creative levels. MacKinnon also found that, even among occupational groups that were more judgmental than perceptive on the whole, the more creative individuals were more equally balanced between the two than the less creative individuals. This suggests the following speculations. First, training in a "complete creative problem-solving process" emphasizing ideation–evaluation at each stage (see Figure 12.1) may promote an increase in acceptance of a balanced approach to creativity giving appropriate perspective to both ideation and evaluation. The educational film called "The Dot and the Line" (Norton, 1965) illustrates the pitfalls of the two extremes of total rigidity and total flexibility and promotes an optimal concept called *disciplined freedom*. Second, perhaps such training serves to move individuals who may be at either extreme on an ideation–evaluation spectrum, towards some optimum (depending on the type of work or field of endeavor involved). The location of this optimum may differ for work requiring higher levels or problem *finding* (e.g., pure research) versus higher levels of problem *solving* (e.g., applied research) and versus higher levels of solution *implementation* (e.g., manufacturing). This thinking is depicted in Figure 12.5.

The notion of different ratios of ideation and evaluation being optimal in different stages is illustrated in yet another way in Figure 12.6. Figure 12.6 represents a revision of the basic model in Figure 12.1. The length of the ideation symbol and the length of the evaluation symbol are the same in Figure 12.1 within and among each of the three stages. In Figure 12.6, however, the lengths are the same only within Stage II; the ideation symbol is longer than the evaluation symbol in Stage I and vice versa in Stage III. These ratio differences in Figure 12.6 are intended to illustrate differences between stages in how much time may be optimal to spend in ideation activity relative to evaluation activity.

The third speculation concerns the relative emphasis on evaluation which is desirable within any given field of endeavor. It may increase within each stage, but from different starting points, as the stages of the "complete process" (Figure 12.1) unfold progressively from problem finding to solution implementation (and vice versa for ideation). This concept is illustrated in Figure 12.7.

Figure 12.5. Possible Optimal Ideation–Evaluation Preference Ratios For Different Fields of Endeavor.



*See Figure 12.1.

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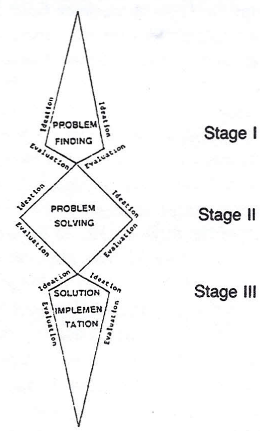
Figure 12.6. Revising Figure 12.1 In The Light of Optimum Ideation–Evaluation Ratio Theory: A Complete Problem-Solving Process Emphasizing Ideation–Evaluation In Each of Three Stages But In Different Ratios.



Note: The three quadrilateral figures representing the three stages are all equal in *Area*. This represents equal time or equal activity. The ratios of ideational and evaluational time or activity are different in the three quadrilaterals.

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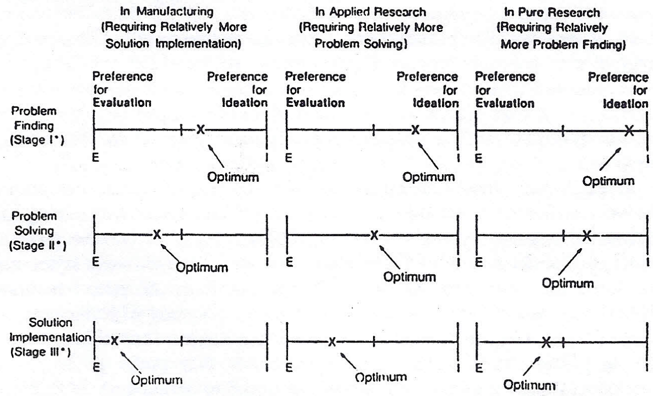
Figure 12.7. Possible Optimum Ideation–Evaluation Preference Ratios for Each of Three States of "A Complete Process of Creative Problem Solving" for Different Fields of Endeavor.



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Discussion

In Basadur et al.'s (1982) applied research with an engineering sample, the appropriate optimum may have been relatively closer to the *E* (Evaluation) end of the ideation–evaluation spectrum than to the *I* (Ideation) end, with the central tendency of the sample falling between the optima for problem finding and problem solving. It may be that for *most* decision-oriented problem-solving professions, such as law, medicine, and engineering, the optimum will be somewhat more on the *E* side, and training in a "complete creative problem-solving process" emphasizing ideation–evaluation will promote a preference for such optima. The optimal ratio between time devoted to ideation activity and to evaluation activity (I/E) would then be relatively lower than the optimal ratio for more pure research professions. This optimal ratio (I/E) would be even lower in implementation fields such as manufacturing. In contrast, for other pursuits with relatively more emphasis on problem *finding* and with fewer time restrictions, like pure research, the optimal I/E ratios would be relatively higher. Also in the former cases, the range of "good judgment" decisions might be much tighter than in the latter cases, requiring more attention to evaluation. For example, for an architect or writer, perhaps there are many diverse acceptable problems and solutions, whereas to a physician or manufacturing engineer, the number of possible good problems and solutions may be more heavily constrained by the reality imposed by the patient's or organization's short-term needs.

The ideation–evaluation ratio is an appealing notion. Future research might determine if indeed optima do exist on the ideation–evaluation spectrum representing optimal ideation–evaluation ratios for each stage of the "complete process of creative problem solving" (see Figures 12.1 and 12.6) for various fields of endeavor. The possibility of increasing evaluation at each succeeding stage of the "complete process of problem solving," and the possibility that these ratios would be different for various fields of endeavor should also be tested (see Figures 12.5 and 12.7). The movement of various samples of trainees from extreme positions of E or I toward some optimal center O should be fully explored.

Research has already shown support for the usefulness of such future exploration. Basadur, Wakabayashi, and Graen (1990) showed that training has differential impacts on individuals with different styles of creative problem solving and preferences related to ideation–evaluation. Such different styles may be related to field of work. Kirton (1987) used his Kirton Adaption-Innovation (KAI) measure and found that departments more concerned with implementation (such as production) have more adaptive creative styles. One could speculate that they favor problem-solving activity because they prefer to deal with problems by staying *within* given paradigms (problem definitions). In contrast, departments more concerned with finding new long term opportunities, such as Research and Development (R&D), have more *innovative* creative styles. It could be said that they favor problem-finding activity, because they prefer to deal with problems by breaking or redefining given paradigms. Interestingly, and in support of this line of speculation, engineering departments, which interface with R&D in the translation of new concepts (problems) into new designs (solutions) and interface with production departments in the translation of new designs (solutions) into manufactured products (implementation), were found to have mean KAI scores roughly halfway between those of production and R&D. This lends support to the usefulness of exploring the concept of optimal I/E ratios, and also indicates that it may be possible to measure these ratios. It would be informative to explore if high or low KAI scores indicate high or low I/E preference ratios. More is said about other future research directions later in this chapter.

ELABORATING ON THE PROCESS AND THE TRAINING

Why Training is Needed

Training in a creative process is an important subject because increasing and managing creativity in organizations is not an easy task. It is difficult to induce the creative process in many organizations for many reasons. One reason is that there are important inadequacies in most organizational members' attitudes and thinking skills (Basadur, 1993; Elbing, 1978). The following shortcomings are common in organizations.

Problem-Finding Shortcomings

People tend to wait for others to find problems for them to solve rather than taking the initiative to seek out, anticipate, and sense problems, changes, trends, and opportunities, current and future. Today, in business, industry, and government—in the world outside the schoolroom—rarely does anyone precisely define your assignment. This provokes some frustration and anxiety in many organizational members adjusting to a world of continual and accelerating change. An important consideration concerns how to live with the anxiety of not knowing what one is supposed to do, how to find out what to do—by oneself—when there are no assignments and no signposts, and the territory is uncharted. Important problems that cross organizational function and department lines are often avoided: "That's not our problem." There is a tendency to overlook "unsolvable" problems and instead concentrate on simpler concerns. Often people make the premature assumption that it can't be done. This sometimes results from too much knowledge of the field of work causing *tunnel vision,* the loss of the power of childlike inquiry, and the challenge of custom.

When confronted with problems and new situations, people tend to evaluate before investigating and often respond automatically or act without carefully thinking. Such early evaluation precludes inquiry into a fuller understanding of the situation. Symptoms are confused with problems, and causes with effects. Data that are really unsubstantiated assumptions are accepted as facts. There is an unwillingness to take the time to discover the real facts that might permit refreshing new ways to define the problem. There is a tendency to deal with problems at face value, rather than ask questions to illuminate reasons behind the more obvious aspects of the problem. This stems from a premature assumption as to the nature of the problem and the inability to understand that the same situation may give rise to diverse goals, motives, and problem definitions for different people and circumstances. This is related to an exaggerated emphasis on problem solutions rather than problem definitions, and the belief that "I already know what the problem is." *Stereotyping,* that is, assuming facts about situations and people based on preconceived notions, is an important perceptual barrier. It leads to prematurely categorizing from previous experience and hearsay. Failure to observe and consider details and investigate the obvious promotes an inability to find a balance between narrowing a problem too much (missing the "big picture") and broadening it too much (not breaking it down into small enough subproblems). This can be further fueled by an inability to use one's imagination sufficiently to see relevance between seemingly unrelated matters.

Problem-Solving Shortcomings

When confronted with new ideas, people are often prematurely critical, shutting down the flow of productive thinking. There is a desire to be perceived as practical and economical above all things, so that judgment comes into play too quickly. Ideas that have some merit but are imperfect are discarded rather than built upon. People are traditionally taught to be very logical and, as a result, start thinking that every problem has only one right answer. They have difficulty in handling ambiguity and tend to believe that things are either right or wrong. Unable to appreciate "shades of gray," they are unwilling to take detours to reach goals. Putting too much faith in past experience causes new ideas to be prematurely mentally tested in the abstract rather than tried out. In contrast, even if they do not work, experimenting with such ideas provides further learning and the potential stumbling upon new and unexpected outcomes and opportunities. People also tend to try to equate new and old experiences. They search for what is similar rather than what is unique in a new problem, and use available solutions rather than consider new or innovative ones. Decisions are directed toward a single goal, whereas most problems involve multiple goals that need simultaneous handling.

Solution Implementation Shortcomings

People are often afraid to implement the creative solutions that they develop. They fear failure and the unknown (which is where their new solution will take them). They fear their solution is not perfect and will subject them to criticism. There tends to be a lack of trust in superiors, associates, and subordinates reflecting a desire to compete, succeed, and move up in the organization quickly. This results in an overly strong desire to conform to accepted patterns, to belong, not to make mistakes, to learn the rules for achieving career success above all rather than make bold, risky decisions. This, plus the fear of making a fool of oneself or being ridiculed leads to the feeling that it is not polite to be too inquisitive, or wise to express ignorance or ask "Why?" about matters that seem to be accepted or known by everyone else. This in turn leads to the *group think* phenomenon in team problem solving (Janis, 1971).

Group Shortcomings

There are other reasons why team work is often uncreative. Group members often are unable to communicate clearly and simply, or fail to define terms well. They assume that "we all know what we mean." This causes fuzziness and time-wasting frustration during team work. Also group members may be unaware that individuals have different styles and methods of thinking and problem solving.

Group problem solving is often inefficient because people are unable to synchronize these differences. Groups often jump into solving the problem without first considering how they will go about solving it, and then flounder. They are unaware of the concept of process, and focus only on context. Meetings may be undisciplined discussions where facts, ideas, evaluations, action steps, and new problems are interjected randomly. Interfunctional teams often get mired by arguing about functional issues rather than focusing on the problem at hand. Groups are also unaware of the different structural roles that must be established and monitored in a meeting. For example, they are unable to discuss, analyze, and agree where *problem ownership* lies, or should lie for any given problem. Problem ownership can vary in degree and in number. Leaders of meetings may not know how to act as facilitators of group process. Rather than coaching the group to find its own way to innovative action, they get involved in content and steer the group toward their own points of view. Rarely will group members debrief their meeting process to examine how their future meetings might be improved. Groups sometimes are also satisfied to just "hold" meetings, not solve problems—the commitment is more to preserve one's place in the organizational membership structure than to actually solve problems.

These shortcomings at the individual and group levels of analysis, classified above into problem-finding, problem-solving, and solution implementation categories, can be overcome. Training in the process of Figures 12.2, 12.3, and 12.4 is designed to improve all three categories at both levels. The section below elaborates on that process and the training.

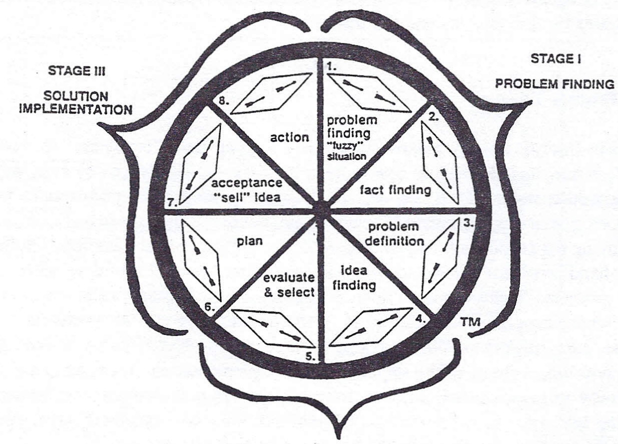
The Process Trained

Problem-finding activity means continously finding new "problems" to work on. This may include finding new product or service opportunities by anticipating new customer needs. It may include discovering important opportunities for improving existing products, services, procedures, and processes, or for improving the satisfaction and well-being of the organizational members. On the other hand, problem-*solving* activity means finding new and useful solutions to such problems. Solution-implementing activity means making such new solutions work successfully for the good of the organization and its members. Of course, such implementation may lead to more new problem finding activity as the environment reacts to the impact of such implementation. Thus, simply put, creativity in organizations can be conceptualized as a continuous and circular finding and solving of new and old problems, and an implementing of new solutions for the betterment of the organization and its members.

In actual practice, it is useful to break the circular process into smaller steps. The rest of this chapter focuses on this circular process, which has been successfully trained and applied in a wide variety of organizations (Basadur, 1987, 1993). The attitudes, behaviors, and thinking skills represented by this model can be trained and learned successfully. One very important aspect of this model is that the *skillful* separation and synchronization of divergent, ideational thinking and convergent, evaluational thinking in each of eight smaller steps across the three stages is necessary for it to be useful. The first three of the smaller steps are caled *problem finding, fact finding,* and *problem defining.* In sequence, they constitute "Problem Finding," Stage I of this complete process of creative thinking and problem solving. Two smaller steps called solution finding and solution evaluation, together and in sequence constitute "Problem Solving," Stage II of this complete process. Three smaller steps called *action planning, acceptance gaining,* and *action taking,* together and in sequence constitute "Solution Implementation," Stage III of this complete process of creative thinking and problem solving.

A critical feature of this model is that the fundamental two-step thinking skill synchronizing divergent thinking and convergent thinking is used in *each* of the eight steps comprising the three stages. The eight smaller steps are arranged in a circular flow as illustrated in Figure 12.8 (Basadur, 1982, 1987). Application of the two-step thinking skill (ideation–evaluation) is required, not only within

Figure 12.8. Organizational Creativity As A Continuous, Circular Process of Eight Steps Across Three Stages.



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each of the eight steps in Figure 12.8, but between steps also. For example, it is critical for problem defining to be deferred until after fact finding, and for idea finding to be deferred until after problem defining; it is also critical that problem *finding* not be confused with problem *defining,* and that creative thought be applied skillfully in the Solution Implementation stage just as in the Problem Identification and Solution Identification stages. A complete explanation of each of the eight steps in the new model is given below.

Stage I

Problem Finding, (the first of the eight steps), consists of (a) sensing problems, changes, and opportunities for improvement in one's present environment, internally and externally to the organization's boundaries; (b) anticipating problems, changes, and opportunities for improvement in one's future environment, internally and externally to the organization's boundaries; and (c) scanning and reading the environment continuously, maintaining a high awareness of environmental events, present and future, internal and external to the organization's boundaries, and creating relevance and making connections between such events and the interests of the organization, especially where the relevance and the connections may not be obvious to others. The result is a continuous flow of new, present and future problems to solve, changes to deal with and capitalize on, and opportunities for improvement for the organization.

Someone who is skilled in problem finding has (a) a tendency to be an initiative taker, problem anticipator, problem sensor, opportunity finder, and welcomer of change as a source of opportunity for improvement or competitive advantage; (b) an attitude of "constructive discontent," a desire for continuous improvement and adaptation, and high comfort with tolerating ambiguity and dealing with vague, unstructured new, "fuzzy" situations; and (c) an orientation toward proactively *seeking out* problems rather than *reacting to* problems. Skill in the two step ideation–evaluation thinking skill in problem finding means deferring convergence and actively diverging to collect large quantities of stimuli from the environment, including problems, changes, and opportunities potentially relevant to the organization, and then screening them to select a smaller number for further exploration (converging). The skill includes tolerating those selected as ambiguous, fuzzy situations, not well defined, but merely tips of the iceberg.

Fact Finding, (the second of the eight steps), consists of first deferring convergence and actively gathering information potentially related to a fuzzy situation (problem, change or opportunity), selected in Step 1, and then evaluating and selecting those facts most likely to be helpful in developing a set of fruitful, advantageous problem definitions in the next step. During divergence in fact finding, evaluation and analysis must be deferred and all points of view or versions of the facts accepted. Establishing what is not known is as important as what is known or thought to be known. It is in convergence that a person or group decides which facts are most relevant and worth clarifying further. Someone who is skilled in "Fact Finding" avoids unwarranted assumptions and examines a given situation from a wide variety of viewpoints, listens well to other people's versions of the facts and accepts them, extends effort in "digging out" further information even when it seems like all facts are already in, and asks fact finding questions in the simplest, most childlike ways, never being too embarrassed to ask questions to increase understanding. After gathering such information, this person is able to converge upon a small number of facts which have special relevance for further development.

Problem Defining, (the third of the eight steps), consists of first using ideation to convert the key facts selected (converged) in Step 2 into a wide variety of creative challenges (problem definitions), then selecting one (or a few) which seems most advantageous to try to solve in the next two steps, 4 and 5. In a sense, in this problem defining step, the *direction* for solving the problem is created. A person skilled in problem defining creates a wide variety of different, insightful challenges from a few key facts. Part of the skill is broadening and narrowing the problem so that both the "forest and the trees" become clearly and refreshingly portrayed. Such a person can break large problems down into smaller components, pinpoint the bigger picture under which the components fit, and is comfortable deferring convergence while creating optional ways of formulating the problem until a clearly superior angle on the problem is developed. This angle or set of angles then becomes the target for solution activity in the next stage of the process. Thus, in Step 3, skill is needed to "ask the right question" to be answered in the next stage of this process of thinking, problem solving, and decision making.

Stage II

Idea Finding (or solution finding) is the fourth of the eight steps. It consists of deferring convergence while actively creating large numbers of potential solutions to the target problem definition(s) posed from Step 3, then selecting a smaller number of the most fruitful solutions for evaluation in Step 5. A person skilled in idea finding creates a wide variety of possible solutions using his or her imagination. These include seemingly radical or impossible solutions, which are then built into other ideas, often less radical yet still refreshing and unusual. Such a person does not stop when a good idea is generated, but instead assumes there are even better ideas yet to come. He or she is also skillful in visualizing ideas and using fragments of ideas to add on to and combine with other fragments to create additional ideas. He or she is also skillful in selecting a smaller number of potentially good solutions for closer scrutiny (in the next step of the process).

Evaluation and Selection is the fifth of the eight steps. It consists of open-mindedly generating a wide variety of criteria potentially useful for making an unbiased and accurate evaluation of the selected solution candidates from Step 4, and then selecting and applying the most significant criteria to decide which candidates, if any, are good enough to take forward to Stage III, "implementation." A person skillful in Solution Evaluation avoids leaping to conclusions based on a single criterion, or on hidden motives not aligned with the targeted problem definition. He or she understands the concept of multiple criteria and takes into account both long- and short-term considerations when assessing ideas. This person is also able to take good ideas that have a significant flaw, and creatively transform them into changed ideas which retain the necessary good characteristics yet no longer suffer from the flaw.

Stage III

Stage III of the process involves implementation. This stage recognizes that problem solving does not end with having developed a good solution. This is only the end of the beginning. Unless the solution is skillfully prepared for implementation, and its implementation skillfully executed, the problem solving will not have been successful. It recognizes that the implementation of a new solution often creates anxiety. Those people affected are being led into the world of the unknown. This causes discomfort as a result of a lack of familiarity and a fear of failure. Many questions may arise: how to gain support for risking change, how to build commitment to plunge into unknown waters, how to tailor a solution for adaptation to specific circumstances, and how to follow up to insure permanent installation of the new change. These are significant, creative ventures of their own.

Research shows that the motivation to act is increased if specific, clear, and realistic yet challenging implementation plans are made by those involved (Locke & Latham, 1990). The probability of successful implementation is increased if the final result is visualized in very specific and concrete terms (Maltz, 1969). Thus, Step 6 is called *Action Planning*. It involves thinking up specific action steps, which will lead to a successful installation of the new solution. The two-step, ideation–evaluation thinking process is used to first generate and then select these specific actions.

Step 7, *Gaining Acceptance*, recognizes that the best laid plans can be scuttled by resistance to the new changes involved. The power of developing ownership of a new idea in gaining acceptance for it is well known in the literature (Coch & French, 1948). Also, people are more likely to accept change if they are shown the benefits of participating in such a change, and if they are shown how potential problems caused by the change can be minimized. The Gaining Acceptance step involves using the two step ideation–evaluation thinking skill. First, alternative ways to create ownership, make benefits understood, and create comfort with potential new problems among those people affected by the change are generated. Second, judgment is applied and the best approach to gaining acceptance is selected.

Step 8, *Taking Action* recognizes that the actual *doing* of an action step is an integral part of the decision making and problem solving process, and not to be taken for granted. No matter how carefully thought out the specific steps in a plan of action, it still remains to *do* the steps. In organizations, often individuals and teams freeze at this step. They get mired in a quagmire of detail and reasons not to proceed. (One aspect of this phenomenon is referred to as *paralysis by analysis.*) This is because the pressures of organizational life highlight the personal biases against taking action common to many people. Some of these biases against action include:

1. The procrastination phenomenon (we find it hard to get started even when we know exactly what to do).
2. The plan for action is either too fuzzy, too complicated, not challenging enough, or unrealistically difficult, or because some steps of it are perceived as especially distasteful.
3. Fear of the unknown, which is where new action may lead.
4. Fear that the plan might fail. Most of us have been taught that failing is a bad thing.
5. Fear that the solution isn't perfect, or that it won't solve the whole problem. Most of us have been taught that answers to problems are either right or wrong. So if some of the problem remains unsolved, or the solution has a flaw, then we must somehow be wrong, because we are obviously not prefectly right.
6. Being unable to say "no" to doing other things that are less important but easier and less risky so the individual can say that he or she didn't have time to take the action indicated.

The management literature contains several remedies for difficulties in taking action (e.g., Bliss, 1976; Lakein, 1973). Some of the techniques that have been found useful in executing step 8 of the process in Figure 12.8 include:

1. Use Closure. Get something started, no matter how trivial, and let one's innate desire to find closure take its course.
2. Make action plans extremely simple, specific, and challenging—but realistic.
3. Use the "Spinach First" principle. Do the part of the plan that you hate the most first to get it out of the way.
4. If you fear the unknown, write down the worst that can happen and then create ideas to cope if it does.
5. If you fear failure, share your plan with others and develop strategies to minimize your discomfort, or even turn failure to your advantage. If you

fear your solution isn't perfect, ask yourself, "If I wait, how much better will a later solution be?" Use reason to move yourself forward if the answer is "no better."

6. Learn to set priorities. Say "no" to lower priority things that will distract you if you let them drag you into doing them.
7. Set deadlines (in writing, if possible) and share your deadline commitments with others. Promise yourself simple but significant and concrete rewards on meeting such deadlines.

The circular nature of the eight step process of Figure 12.8 means that the ninth step is really the first step of the next rotation or cycle. Each action taken to implement a new solution automatically results in new problems, changes, and opportunities as it interacts with new stimuli in the environment. Such interactions create a divergent array of new problems, changes, and opportunities for scanning and sensing, for more Step 1 (problem-finding) activity.

That deferring convergence and using active divergence are fundamental not only within all eight steps but also between all eight steps of the process in Figure 12.8 is difficult for many people to comprehend, accept, and put into practice. For example, in practice, many managers tend to prematurely believe they already know what the problem is, and so proceed by assembling just enough facts and assumptions to support this biased perception. When this occurs, the first course of action that presents itself as potentially good enough is immediately attempted. In sharp contrast, the models of Figure 12.1 and 12.8 provide for delaying any rush to action in favor of the creation of refreshing, expanded, and creative formulations of the problem from unusual, thought provoking angles and perspectives. This is based on skill in open-minded, divergent fact finding leading to the discovery of fresh facts and the dismissal of unwarranted assumptions. Kettering once said, "It's amazing what ordinary people can do if they set out without preconceived notions" (Parnes et al., 1977).

The process presented in this chapter suggests that *decision making* and *problem solving* are incomplete unless they recognize problem identification and solution implementation, as well as solution development, as equal partners. The model suggests that, when problems are solved and solutions are implemented, the problem-solving and decision-making process is not finished, but merely continues on to sensing the new problems created. Research and experience indicate strongly that the thinking skills and associated attitudes that make this process work can be learned, nurtured, and managed in organizations.

FUTURE RESEARCH DIRECTIONS IN CREATIVE BEHAVIOR MODELING

There are other future research directions in addition to those suggested for the optimal ideation–evaluation ratio concept described earlier in this chapter. The relationships indicated in the revised theoretical model proposed in Figure 12.4

above should be tested further. This is especially true of the links between acceptance and practice of ideation–evaluation and performance. Further, the entire ideation–evaluation process should be measured at each stage of the complete process (see Figure 12.1) including the implementation stage.

The possibility that longer, intensive training periods or other training modifications or approaches might provide increased or new impacts on trainees should be considered. Also, the generalizability of the models and concepts should be investigated for other kinds of organizations, especially across different relative ideation–evaluation tendencies. Also, nonindustrial organizations, and other kinds of research disciplines, such as basic research, market research, and nonresearch organizations, should be studied. Duration of effects should be investigated, including assessments of what organizations might do to sustain the effects. The links between the exogenous group, organizational, and external individual work-related factors and the nine antecedent factors of the theoretical model described in Figure 12.4 should be researched. The link between the problem-finding, problem-solving, and implementation performance factors of the model and the final organization creative output factor in Figures 12.2, 12.3, and 12.4 should be investigated.

Ultimately, the cognitive and personality identification approach to creative capacity, style, and behavior research should be integrated into the above organizational creativity process modeling work. For example, could the process help identify more creative or more trainable individuals? Does process training affect cognitive and personality characteristics, and could these effects be usefully incorporated into the theoretical model advanced above? Finally, the relationships among the exogenous factors identified in Figure 12.4, and the factors themselves, need to be clarified, tested, and expanded. Hopefully, the models presented in this chapter will supply other researchers with a launching point for developing their own models and ideas as well as modifying, clarifying, and expanding the models themselves.

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