An Ecological Approach to Creativity Research: Profiling for Creative Problem Solving

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Creativity is not a term that simply describes a category or kind of person. Rather, creativity has been viewed by many as a multi-faceted phenomenon which results in the production of new and useful ideas. Creative performance, therefore, can be viewed as the result of interactions among several important components or dimensions of creativity. These dimensions were described by Rhodes (1961) as person, process, product, and press. Similar descriptions have also been proposed in a number of other studies and reviews (e.g., MacKinnon, 1978; Mooney, 1963; Raven, 1984; Stein, 1968; Treffinger, 1988, 1991; Treffinger, Sortore, & Cross, 1993).

The purposes of this paper are to describe a major program of research at the Center for Studies in Creativity, "The Profiling Project," based on an ecological or interactionist approach to creativity, and to outline several important implications of this research for theory and practice. The explicit focus of this program of research is on the continued development and application of Creative Problem Solving (CPS; Isaksen, Dorval, & Treffinger, 1993; Treffinger & Isaksen, 1992). CPS is a descriptive process model which can be used to define or formulate problems, generate ideas, and refine solutions for implementation. We will begin by reviewing historical research that led to and shaped the current research initiative. We will also describe other recent investigations that influenced our methodological approach to the research. We will offer a working definition of profiling, describe several major questions currently under investigation, and suggest possible implications of this program of research for theory and practice.
characteristics, cognitive abilities, and behavioral or biographical events associated with individual creativity. Work in the area of process has delineated various steps, stages, and strategies within the creative process. Studies of creative products have revealed important variables that distinguish more creative from less creative products as perceived by different people for different purposes. Finally, investigators have identified environmental (press) factors that facilitate or inhibit creative performance.

Although it has often been observed that creativity involves the simultaneous interaction among elements of all four themes, many past investigations tended to involve only variables from a single dimension. Past investigators dealt with the multi-faceted nature of creativity primarily by attempting to separate it into manageable areas of investigation. This separatist approach enabled researchers to focus their attention solely on variables within a specific dimension, without concern for potential interaction effects created by other variables. Further, within each dimension, researchers often employed a reductionist approach. That is, the major goal of many early investigations was to reduce one dimension of creativity, such as person, to the most fundamental or basic variables that would best predict creativity in a broader or more general conception. Although this approach allowed researchers to manage the dynamic nature of creativity efficiently and with some degree of operational precision, this approach did not adequately reflect the multi-faceted nature of the phenomenon of creativity (Isaksen, 1987b; Murdock & Puccio, in press; Puccio, 1990; Treffinger et al., 1993). As Rhodes (1961) observed, “Each strand has unique identity academically, but only in unity do the four strands operate functionally” (p. 307). Prior research has clarified our understanding of many important variables within each dimension by separating the four themes or dimensions for the purposes of systematic investigation. However, previous research has not demonstrated how these variables interact in real situations to influence creative productivity. In other words, few investigators have explored how aspects of the person, the processes they use, the nature of the environments they work in, and the qualities of the products they create interact to yield varying levels and styles of creative productivity. Specifically, in relation to CPS, we can identify three broad stages or historical "waves" of research and development.
These are: (a) process development; (b) linking process to person; and, (c) an ecological approach.

The separatist approach to understanding creativity was evident in the early development and testing of CPS. Much of this initial work focused primarily on the process dimension of creativity. This enabled the developers of CPS (e.g., Osborn, 1953; Parnes, 1967; Parnes, Noller, & Biondi, 1977) to direct their efforts to building an effective process model, without having to consider deliberately the impact of all the possible variables from the other dimensions of creativity. The end result of these efforts was a widely applicable process model that has been shown to significantly enhance individuals' abilities to solve problems and think creatively (Parnes & Noller, 1973; Torrance, 1972, 1986).

Research reports from the Creative Studies Project (Parnes & Noller, 1973; Reese, Parnes, Treffinger & Kaltsounis, 1976) served as landmark investigations of the impact of CPS. They studied the impact of participation in a series of four undergraduate courses in CPS on various measures of students' academic and creative achievement, creative-thinking and problem-solving skills, and personal decision making. In retrospect, those studies helped to highlight the importance of interactionist research. The content of the undergraduate courses focused specifically on various aspects of the creative process. Relatively little attention was given to the nature of the interactions among process and other dimensions of creativity. The studies successfully demonstrated the positive impact of creativity training (see, for example, Rose & Lin, 1984 or Torrance, 1987). However, they also indicated the critical need for studies of possible interaction effects between CPS performance and other individual difference variables. Parnes and Noller (1973) found, for example, that students who dropped out of the course sequence without completing all four courses tended to share similar personality traits. They described these students as being spontaneous, fluent, novel, and artistic. Further, “The drop-outs appear to be people who are interested mainly in quick idea-production rather than viewing this in the context of a disciplined process” (Parnes & Noller, 1973, p. 20).

We can now interpret these results more clearly than would have been possible at that time. These early efforts, viewed from today's perspective, reveal that although the educational program had a positive impact on most of the
students, it was not equally well-suited for all participants. There appeared to be an interaction between certain individual difference variables and the course content, so the program was more effective for some students than for others. This marks the transition from the first to the second “wave” of CPS research. To increase our understanding of how individuals could best learn and apply CPS, it became clearer that efforts were needed to investigate interactions between student characteristics and process aspects of CPS.

The first wave of research and development established a CPS process framework and an instructional program designed and tested for the enhancement of creative-thinking and problem-solving skills. The second wave focused on understanding some of the important individual differences relevant to this framework and instructional program. In response to this need, several research projects were conducted in which learner characteristics, their interrelationships, and their implications for instruction have been investigated. This issue, known generally as the investigation of aptitude-treatment interactions (ATI) has been tantalizing but elusive (as well as controversial).

Aptitude-treatment interactions have been the focus of considerable research in educational psychology, although they have not been studied specifically in relation to the four major dimensions of creative productivity. Many researchers have studied a variety of individual difference variables, and their separate and interactive impact on student performance in a number of academic areas (e.g., Cronbach & Snow, 1977; Snow, 1989, 1992).

For creativity researchers, the question of ATI has posed a major challenge. Snow (1992), for example reviewed ATI research that dealt with the hypothesis that “thinking skills reside in the person-situation interaction, not solely in the mind of the person” (pp. 19-20). The goal of these studies was to seek disordinal interactions, or studies in which students with a certain combination of characteristics performed best in a certain educational program or treatment, whereas students with contrasting characteristics performed better in a contrasting treatment. It was believed that this information would allow practitioners to more effectively match certain individuals to certain educational programs, thus improving students’ success and productivity. Unfortunately, despite
the tantalizing appeal of this reasoning, such clear-cut, powerful disordinal interactions have remained quite elusive in most areas of educational programming.

A major aspect of work to understand individual differences and how they can affect and link to CPS process has been examining learning and cognitive styles. Wittig (1985) and McEwen (1986) studied relationships between learning styles and various measures of divergent thinking and feeling. McEwen's results, for instance, showed that students with different learning styles expressed their creativity in varying ways. To examine the interactions between individual differences and CPS process dimensions, Isaksen (1987a) initiated a research program called the Cognitive Styles Project. More specifically, the goal of this project was to examine the nature of the interactions between preferred ways of processing information and creative problem-solving behavior. Zilewicz (1986) conducted an early study within this project. He compared the problem-solving strengths and weaknesses of individuals who reported different cognitive style preferences as measured by the Gregorc Style Delineator (Gregorc, 1982). Although a number of distinct differences emerged among the four cognitive style preferences identified by Gregorc's measure, a later study by Joniak and Isaksen (1988) demonstrated major psychometric limitations in this measure.

Our search for reliable and valid measures of individual difference variables that might be particularly germane to the study of creativity has continued. These efforts have led us to focus our attention on three instruments: the Kirton Adaption-Innovation Inventory (KAI; Kirton, 1976), the Myers-Briggs Type Indicator (MBTI; Myers & McCaulley, 1985), and the Productivity Environmental Preference Survey (PEPS; Dunn, Dunn, & Price, 1986). These and other instruments, that are well-supported by theory and research, now serve as sources of data for our continuing studies of the interaction between individual difference variables and process dimensions (Dunn, Dunn & Treffinger, 1992; Treffinger 1988; Treffinger & Selby, 1993).

In drawing the distinction between style or preference and level or capacity, the theory which so far has received the greatest attention has been Kirton's Adaptor-Innovator distinction. Kirton (1976; 1989) consistently maintained that
his cognitive style theory and measure are unrelated to creative capacity or level. His theory posits two styles of creativity. The adaptive style is characterized by working within the system to improve it, while the innovative style is described as challenging the current system or paradigm. Studies conducted by Puccio (1987), Isaksen and Puccio (1988), Dorval (1990), Tefft (1990), and Isaksen, Dorval, and Kaufmann (1991) examined the implications of this theory for problem-solving behavior.

Puccio (1987) showed that fluency and originality in problem-defining behavior was significantly related to individuals' adaptor-innovator preferences. The innovators in this study were significantly more fluent and original in their generation of problem statements for a business case study. Isaksen and Puccio (1988) also showed that fluency and originality, as measured by the Torrance Tests of Creative Thinking (TTCT; Torrance, 1974), were significantly related to Kirton's measure. Again, innovators were significantly more fluent and original than adaptors. Dorval (1990), in an investigation of imagery and creativity, discovered that the distinction between level and style extended to the domain of imagery. In particular, analyses revealed a clear relationship between style of creativity and level of conscious modes of representation (Isaksen, Dorval & Kaufmann, 1991). Individuals with an innovative style preference reported significantly greater use of both verbal and imaginal modes of processing. Although many of these studies found significant relationships between style of creativity and various indicators of level, Tefft's (1990) factor analytic investigation of the KAI, the TTCT, and the MBTI supported the conceptual distinction made by Kirton between level and style measures. More extensive discussion of the level-style issue and the results of the Cognitive Styles Project is provided by Isaksen and Dorval (in press).

Several other recent studies demonstrated important links between person and process variables. Rickards and Puccio (1992), for example, showed that adaptors believed their greatest contributions in applied problem solving occurred during the convergent phases, whereas innovators maintained that their best contributions came during the divergent phases. Gryskiewicz (1980, 1987) also linked Kirton's theory to process by identifying the impact of certain creative-thinking strategies on the kinds of ideas generated for real problems.
These investigations contributed significantly to our knowledge of the interaction between characteristics of people and aspects of the creative process (and CPS in particular). The results of these studies have been incorporated into CPS instructional programs, and used to help learners better understand their personal orientations to the creative process (Isaksen, Dorval, & Treffinger, 1993; Treffinger & Isaksen, 1992). Once individuals understand their style preferences they understand better their natural, personal approach to thinking and problem solving. As a result, they can approach the task of learning CPS more constructively, rather than viewing their task merely as attaining proficiency with an externally-imposed, fixed set of techniques. They can assess their own process strengths and needs more effectively. In addition, as individuals become aware of various style orientations, it becomes easier for them to understand and accept the principle that there is more than one "right way" to use the CPS process (Pershyn, 1992).

Although the results of research in this stage did enhance instructional efforts in CPS, it became clear that the person–process interaction only addressed some of the important dynamics in understanding creativity and creative productivity. To optimize any person's ability to learn and apply CPS, we began to recognize the need for a broader, more flexible approach, and the need to study the dynamic interactions among people, situations, processes, tasks, and outcomes. Building upon the results of the second wave of research, in conjunction with expanding contextual views of creativity, the current wave of creativity research undertakes an ecological approach.

An individual's use of CPS does not occur in a vacuum. Through our present and emerging research, we seek to discover more about the nature of interactions among many relevant contingencies and their implications for instruction, training, and future refinements of the CPS process itself. The foundations for this ecological approach were originally set out in the early work of Guilford (1977), Torrance (1979), and MacKinnon (1978), who agreed that the phenomenon of creativity was anything but unidimensional, and that new and emerging research and statistical methodologies could be used to improve our understanding of this multi-faceted concept. Since then, numerous models have been added to the literature to encourage creativity research to incorporate a

Our methodology for dealing with these challenges can best be described as an interactionist, or ecological approach. We are concerned with the interaction of several variables within a specific context, very much like the ecologist who explores the interactions among living and non-living components within an ecosystem (Rodgers & Kerstetter, 1974). One of the explicit goals for our emerging research agenda is to understand better and build more effectively upon the multi-faceted nature of creativity, through interactionist, rather than only reductionist, methodologies. Our goal is to understand the natural interactions among the sources that lead to creative productivity. We believe that too many previous investigations have artificially separated creativity, for analytic or experimental simplicity or convenience, into separate or isolated topics of study (e.g., focusing only on person or on process). Unlike the blind men in the well-known parable, we seek to study the whole elephant, not just its parts.

The conceptual principles underlying an interactionist approach are certainly not unique. A number of other writers building on the foundations established by Guilford, Torrance and MacKinnon, also emphasized the need for studying complex interactions in creativity research (e.g., Rhodes, 1961). Treffinger and Poggio (1972) stressed the importance of multivariate approaches in creativity assessment. Stein (1975) aptly captured the applied goal of an interactionist approach to creativity research when he stated, “In the final analysis, we need to know what kinds of people use what kinds of techniques with what kinds of problems under what kinds of conditions” (p. 283). More recently, Helson (1988) provided further support for the need for interactionist creativity studies when she argued:

The vitality in the field today comes from real-life studies that contextualize, rather than compartmentalize, creative behavior. The use of historical, developmental, and ecological contexts, in combination with our tools for measuring creativity and personality, should enable us to see more clearly which persons are creative, how, where, and why. (p. 58)

Additional support for an ecological approach was provided by Harrington (1990) who presented a framework for
examining the functional relationships among people, processes, and ecosystems.

Despite the increasing emphasis on the need for interactionist research, relatively few investigations have endeavored to undertake this approach. Some investigations have examined interactions between person and press variables (e.g., Andrews & Faris, 1972; Isaksen & Kaufmann, 1990; Kirton & McCarthy, 1988; Koberg & Chusmir, 1987; Owens, 1969; Puccio, 1990; Wesenberg, 1986). It remains difficult to find studies that have examined other interactions among other combinations of the dimensions of creativity, such as person—product interactions, or process—press studies. Only through systematic investigations of more complex interactions will researchers and practitioners be enabled to predict creative outcomes in specified contexts more effectively. We believe that research in these areas will also yield findings which will be highly transferable to real-life settings and applications.

The term “profile” has often been construed only in a narrow, limited view to represent a summary or sketch of an individual's traits or abilities. The customary image of a profile is a transcript or presentation of a series of scores from various personality, aptitude, or achievement measures. In some cases, there might be an emphasis on the importance of gathering data from several sources (as, for example, in the common admonition to use “multiple selection criteria” in educational settings).

Our continuing research efforts will initially employ the following definition of profiling: Profiling refers to the development of a multi-dimensional framework to help understand, predict, and facilitate Creative Problem-Solving performance. This framework takes into account a constellation of cognitive, metacognitive, and personality characteristics; dimensions of the situation, such as climate and culture; elements of the task; process behaviors; and product or outcome qualities.

This approach to profiling builds upon the ecological and interactionist views regarding creative productivity and marks what we believe to be a unique and significant departure from some more popular uses of the term. To clarify further the nature and implications of an expanded conception of profiling, two important premises clearly emerge and must be addressed.
First, creative productivity does not come about (or fail to come about) only as a result of what is present (or absent) within the individual; it is influenced by time, other people, places, settings, domain-specific knowledge and strategies that people can use individually or in groups. Therefore, no one is, in an absolute sense, always more or less creative. We must ask, creative at what, when, how, where, why, and with whom. We shouldn't "look for" creativity as something fixed and static; it waxes and wanes dependent on a combination of multiple factors. Thus, the goal of profiling is not to ask, "How creative is this person?" It is not just to aggregate several independent data sources in order to obtain an overall index or categorization of the person. Rather, it is to help identify, for a particular task or goal, in a certain setting and under particular circumstances, the person's creative strengths or talents, the best ways to put them to use, and plans to enable us to incorporate those talents into a meaningful and effective instructional or training experience.

Second, creativity is not just something that happens to people; it is actively and deliberately employed, monitored, and managed. Creativity can be enhanced and nurtured. Research has demonstrated that specific process tools and strategies can be used to increase creative-thinking skills (e.g., DeShon & Firestien, 1992; Firestien & McCowan, 1988; Parnes & Meadow, 1959; Parnes & Noller, 1973; Torrance, 1972, 1986). Process dimensions may be defined in many ways, but an individual's profile reflects a particular set of process skills. The exact nature of the targets or goals of the profiling effort must always be clearly specified. Our research, for example, is primarily concerned with CPS, rather than another model from among the variety of available models and programming approaches.

Figure One represents graphically the five major dimensions we believe should be considered in an ecological view of CPS. Since we are concerned with understanding, predicting and facilitating CPS performance as criterion variables, we will describe in more detail what we mean by CPS performance. This represents a set of potential dependent variables for future research. Then we will describe the five dimensions that will influence this kind of behavior. These represent potential independent variables for future research.
The variety of constructs and variables contained within the CPS framework provide a rich source of potential for ecological research. The same variety that leads to rich potential also creates several significant initial challenges in establishing the foundation for ecological research. We must begin by identifying gaps in our knowledge and understanding of CPS; these gaps represent opportunities for development, rather than obstacles to research progress. In order to create and use an ecological profiling approach to CPS as productively as possible, we must be able to define clearly and represent appropriately an important set of variables — the underlying skills, cognitive processes, and preferences associated with, and distinguishing among, the elements of CPS. We must establish reliable, valid, and authentic methods to assess these variables and constructs.

Therefore, the development of assessment procedures for CPS criterion variables will be one of the first undertakings within this new research program. Some initial work has already begun to examine the skills and preferences that distinguish the six CPS stages from each other. Once clear and distinct skills have been identified, the interactions can be clearly interpreted in light of the six CPS stages. For instance, one can postulate that there may be an interaction between individuals' style of creativity, the nature of the products they produce, and their perception of the psychological climate of their workplace on problem-finding behavior.
Because we are proposing a broad definition of profiling to understand, predict, and facilitate CPS, we will briefly review each of the five dimensions of possible independent variables for future research. In particular, we present in Table One a number of illustrative contingencies for each dimension. In addition, since profiling reflects an interactionist approach, we will attempt to describe each dimension in terms of its potential interactions with the other dimensions.

### Table 1

<table>
<thead>
<tr>
<th>Personal Orientation</th>
<th>Situational Outlook</th>
<th>Task</th>
<th>CPS Process</th>
<th>Outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td>Style</td>
<td>Psychological climate</td>
<td>Importance</td>
<td>Flexible, descriptive approach</td>
<td>Concreteness</td>
</tr>
<tr>
<td>Competencies</td>
<td>Cultural values and norms</td>
<td>Kind and degree of ownership</td>
<td>Novelty</td>
<td></td>
</tr>
<tr>
<td>Motivation</td>
<td>Organizational culture</td>
<td>Ambiguity</td>
<td>Divergence-Convergence Balance</td>
<td>Usefulness</td>
</tr>
<tr>
<td>Gender</td>
<td>Predominant leadership styles and behaviors</td>
<td>Complexity</td>
<td>Components</td>
<td>Completeness, resolution</td>
</tr>
<tr>
<td>Personality traits or characteristics</td>
<td>Reward systems and structures</td>
<td>Novelty</td>
<td>Stages</td>
<td>Synthesis, stylistic quality</td>
</tr>
<tr>
<td>Knowledge base and expertise</td>
<td>Resources and support</td>
<td>Projected timeline</td>
<td>Tools</td>
<td>Diffusion</td>
</tr>
<tr>
<td>Teamwork values and skills</td>
<td>Strategic orientation</td>
<td>History</td>
<td>Client characteristics</td>
<td>Impact</td>
</tr>
<tr>
<td>Habits, barriers, and blocks</td>
<td>External constraints (real or perceived)</td>
<td>Involvement of others</td>
<td>Facilitation qualities</td>
<td>Marketability</td>
</tr>
<tr>
<td>Commitment and attitude toward CPS</td>
<td>Current conception of domain of work</td>
<td>Vision of desired future state</td>
<td>Resource group attributes</td>
<td>Satisfaction (energy, enjoyment)</td>
</tr>
<tr>
<td>Others</td>
<td>Others</td>
<td>Others</td>
<td>Others</td>
<td>Others</td>
</tr>
</tbody>
</table>

Personal orientation includes what is traditionally thought of as characteristics of the creative person as well as the creative abilities associated with creativity. These include personality traits traditionally associated with creativity such as openness to experience, tolerance of ambiguity, resistance to premature closure, curiosity and risk-taking, among others. They also include such creative-thinking abilities as fluency, flexibility, originality and elaboration. One’s expertise, com-
petence, and knowledge base also contribute to creative efforts. In addition, recent research has shown that personal orientation contingencies must include several aspects of the person's cognitive and learning style. Furthermore, this dimension also examines individuals' orientations to the other four dimensions, such as the their commitment and attitude toward CPS or their expectations concerning the desired outcome.

Situational outlook involves many elements surrounding the context in which CPS will be used. These contingencies include an individual's perception of the psychological climate or the organizational culture, the predominant leadership styles and behaviors and the nature and function of the reward systems and structures. Peoples' perceptions and conceptions of their work and the overall strategic orientation (e.g., growth or decline of industry or market) are also important aspects of the situation. The ways people understand and react to their situation also lead to variations in assessing or selecting tasks. The amount of reward and leadership support for using CPS, the values and norms regarding outcomes, or the impact of perceived external constraints on individuals' motivation can also be influenced by the contingencies within situational outlook.

Our ecological view departs significantly from past interactionist descriptions of creativity (e.g., MacKinnon, 1978; Rhodes, 1961; Stein, 1968; Treffinger, 1991) by including a task dimension. It encompasses the general domain within which CPS will be utilized, and includes a description of the desired outcome. Considering the task dimension permits qualification of the context, the problem solver and the appropriate use of the CPS framework. A preliminary analysis of the task provides an understanding of the nature of the intended outcomes and the factors influencing success. Task appraisal arises from the interaction between personal orientation and situational outlook. Although there are undoubtedly countless outcomes which result from the interaction of these two domains, our experiences in applying CPS have highlighted the critical influence of certain task contingencies, such as the degree to which the individual owns or can influence the problem or opportunity (Isaksen, Dorval & Treffinger, 1993; Isaksen & Treffinger, 1985; Treffinger & Isaksen, 1992). Moreover, the content for the
application of CPS may be determined by the nature of the task. The extent to which the task is ambiguous, complex or novel may influence the approach to CPS. The initial vision of the desired outcome may also influence CPS performance in several ways (e.g., selecting tools; selecting and using CPS components; use of specific CPS stages).

Defining a specific focus for profiling (in our case, CPS performance) offers several advantages. The well-defined nature of the current version of the CPS process (Isaksen, Dorval & Treffinger, 1993; Treffinger & Isaksen, 1992) provides a clear structure within which to assess the impact of potential interaction effects. A complex, multi-faceted profiling approach becomes relevant and essential only when one’s view of CPS as a process framework has also become more sophisticated. Effective practitioners have long since passed the view of CPS as a fixed sequence of prescribed steps and activities. To use CPS productively, it is necessary to make deliberate decisions about the components, stages, and techniques that will be appropriate and valuable. Current approaches to CPS view creative problem solving descriptively, and allow for the clear identification of the purpose and intended outcomes of the process.

Further, the comprehensive nature of CPS provides a fertile forum for interactionist investigations. The researcher can examine interactions at several different levels. Some investigations might explore, for example, the basic principles of divergent and convergent thinking. At another level, potential interaction effects can be investigated among the three major components of CPS (Understanding the Problem, Generating Ideas, and Planning for Action). Researchers who desire a more precise examination might alternatively focus on the six specific CPS stages (Mess-Finding, Data-Finding, Problem-Finding, Idea-Finding, Solution-Finding, and Acceptance-Finding). Other studies might probe each of the stages more specifically, examining interaction effects among specific CPS tools (e.g., brainstorming, highlighting, criteria matrix, and paired comparison analysis).

The CPS process contingencies may also effect variables from the other dimensions. For example, the components selected for use as well as the techniques utilized may effect the degree of satisfaction with the process outcomes. Of course, the nature of the task, the style of the people engaging in process activity and the context within which they are
operating (among others) can influence the facilitation qualities that will be most effective for a particular session as well as the needed or desired attributes of resource-group members. The possible interactions, as with all the dimensions, are numerous.

The outcome dimension refers to the results of process. Outcome contingencies differ from task contingencies in that the latter relate more to the initial or desired results. Outcome contingencies deal with the actual or real results of the CPS process. These may be tangible (e.g. concreteness) or intangible (e.g. satisfaction). The nature of the results can be considered from the point of view of the product or outcome itself, or by how well it is diffused and accepted by others. Outcomes can also be assessed for their level of novelty, usefulness and other criteria. Outcome contingencies may be affected by the level of ownership found in the task dimension. Productive outcomes must be accepted and diffused into particular contexts (situational outlook). The desire for certain outcome qualities, such as novelty, usefulness, or completeness, may be influenced by elements found in personal orientation, and may in turn impact use of CPS (Besemer & Treffinger, 1981; Besemer & O'Quin, 1987; O'Quin & Besemer, 1989).

Ecological research on profiling will examine the effects of various contingencies within personal orientation, situational outlook, task and outcome dimensions, and their interactions, on several constructs and variables associated with effective CPS performance. Furthermore, these investigations will seek to illuminate additional variables that impact the successful application of CPS, thereby enabling us to continue to refine an ecological understanding of CPS. As our understanding of the interactions increase and deepen, we may also find that other variables and contingencies may be important to consider.

We view ecological or interactionist research on CPS as an important basic research challenge, in that these efforts will help us to understand better the complex nature and dynamics of CPS process and creativity more generally. But the research can also be considered to be applied in nature. CPS is a very popular process in both educational and business settings. As a result, the outcomes of ecological or interactionist research will have important implications for
many trainers, consultants and other practitioners. We anticipate many positive implications for theory, development, research, and practice will emerge from continuing research on profiling for CPS.

At the broadest level, these implications and benefits will be derived from explicit efforts to construct vital bridges between theory and practice. Through profiling studies, researchers can investigate interactions of the kinds that occur in real situations. The results should inform theory construction or development and provide practical guidelines and support for practitioners concerned with CPS instruction at many age levels and in a variety of settings.

A short-term benefit will be enhanced transfer of research outcomes. Since the interactionist methodology to be used in our research (such as more advanced multivariate quantitative techniques as well as theoretically grounded qualitative approaches) will better reflect the nature of creativity in realistic and applied settings, it should therefore be much easier to apply these findings to real situations. If this research shows, for example, what kinds of process strategies work best for what kinds of people and under different circumstances, then facilitation of creativity in settings where these variables exist should be more predictable and targeted. A profiling approach to CPS can help communicate specific outcomes associated with the interactions of certain factors that can be useful to creativity professionals in targeting application of tools and techniques.

Another potential benefit is the development of autonomous problem solvers. In other words, individuals who can develop effective metacognitive strategies based on their awareness of their own personal strengths, the constraints present in the situation, the relevant task demands, the process techniques at their disposal, and the desired outcomes of their problem-solving efforts. If individuals, for instance, recognize that their problem-solving preferences increase the likelihood that they will produce certain kinds of products, and they currently face a problem that requires a different type of solution, they can consciously select CPS techniques that will help them to meet the demands of that particular situation. As Messick (1976) noted:

It may be possible for individuals to learn to use optimal problem-solving and learning strategies conso-
nant with their cognitive styles and even to learn to shift less congenial strategies that are more effective for a particular task than are their preferred ones. (p. 6)

Information gained through this research program will also benefit individuals who plan to facilitate and lead CPS sessions. Facilitators will be better able to use information about the people involved in their sessions, the products they produce, and the nature of environments they work in, and as a result, will be able to develop more effective process plans. For example, by engaging in task analysis prior to using CPS, facilitators will be able to discriminate between those opportunities and challenges that can benefit from the use of CPS and those that should be approached with some other framework or methodology. We expect that profiling research outcomes will lead to more successful outcomes for participants, and therefore, to increased satisfaction with training or instructional experiences.

Knowledge concerning the various influences that interact with CPS will undoubtedly stimulate further theoretical development of this process model. For instance, information that suggests that CPS is particularly relevant and useful to individuals who work in certain environments and possess particular characteristics, may foster the development of techniques that are useful for others in different circumstances.

One immediate benefit of the ecological approach to profiling CPS has been the reconfiguring of personal orientation and situational outlook. These constructs were previously packaged within the CPS process itself, rather than being seen as important and independent concepts (Isaksen & Treffinger, 1985). By placing these dimensions outside the confines of process but within the relevant set of contingencies, continued and extended productive inquiry could result. In addition, the aspects of process which previously held these concepts were unnecessarily complicated. In short, findings from this ecological research approach will lead to a more comprehensive and flexible process model placed within an improved context.

An ecological approach provides an opportunity to make a deliberate appraisal, based on several factors, of the appropriateness of applying the CPS framework. This becomes
possible when task appraisal takes place outside the CPS process itself, and thereby enhances our ability to qualify the client of a CPS session, the context and the actual use of the framework. Becoming more clear about those tasks that can benefit from CPS and those for which another framework or approach would be better, promotes an improved fit and clarity between needs and process alternatives. As a result, we can avoid potential loss of time, effort, and energy because of inappropriate application of the CPS framework.

An ecological approach to creativity research will also serve to improve our understanding and use of specific terms, variables and contingencies. Better definitions and applications can result, serving to improve the clarity and precision of future research. Rather than over simplifying and under defining creativity, we can encourage a more comprehensive and meaningful approach for future research.

Profiling is best used as a vehicle to help identify peoples' strengths and talents for a particular goal or task, in a particular context and circumstances, for specific outcomes. It will establish a foundation for more authentic or genuine assessment (Wiggins, 1989). A more comprehensive and inclusive conception and understanding of creativity may result from consideration of the five dimensions of the ecological framework and their interactions. This targeted approach to profiling CPS may stimulate advances in creativity assessment methodology and lead to better measures and greater understanding of the complex and important human resource we call "creativity."

CONCLUSION

This paper has presented a description of a new major program of research currently underway at the Center for Studies in Creativity. We have placed this research program within a historical context and described its major purposes and questions to be addressed. It is our intention to aim for a more complete picture of the concept of creativity by focusing our attention on an ecological approach to profiling CPS. By improving our understanding of the interaction of the key contingencies identified in this paper, it is our hope to encourage the development of more reflective practitioners within the field of creativity and innovation (Schön, 1983).
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