CREATIVITY AND INNOVATION IN ORGANIZATIONS

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UNLEASHING CREATIVE TALENT IN ORGANIZATIONS – LINKING LEARNING AND CREATIVITY THROUGH CREATIVE PROBLEM-SOLVING

Scott G. Isaksen

Introduction

We live in an increasingly volatile, uncertain, complex, and ambiguous (VUCA) world (Bennett & Lemoine, 2014). More than ever, we need to understand and nurture the creative talent of those who can help meet the innovation challenges that organizations face. The VUCA world also has changed the nature of work (Barley, Bechky, & Milliken, 2017; Noe, Clarke, & Klein, 2014), resulting in the concomitant demand for employees and managers to understand, develop, and apply creative talent.

Learning and creativity are complex, multifaceted, and multilevel constructs, and when we examine the conceptual and practical linkages between them, many implications emerge. This is not the first general effort to build conceptual bridges between learning and creativity (for examples, see Beghetto & Kaufman, 2009; Kazanjian & Drazin, 2012; Lubart, 2008; Pagano, 1979). Within the educational arena, there has been long-term interest in linking creativity and learning (Kagan, 1967). In fact, there are many resources that promote creative learning within our educational system (Sefton-Green, Thomson, Jones, & Bresler, 2011; Torrance & Myers, 1970; Treffinger, Schoonover, & Selby, 2013).

The purpose of this chapter is to examine these linkages with a focus on the organization. First, we review the conceptual and theoretical foundations of learning and creativity at the individual, group or team, and organizational levels. Once this foundation is laid, we identify a few key elements of integration. One of these will be the method of creative problem-solving (CPS) as a deliberate and practical way to unleash creative talent in organizations. This chapter provides a current description of CPS, discusses research supporting the approach, and identifies some productive pathways for future research.

Conceptual and Theoretical Foundations

Learning

Learning is one of those concepts that everyone uses, yet no universally agreed definition exists. It has been a core concept in psychology since the very origins of the discipline, but researchers are rarely explicit about what they mean by the term (De Houwer, Barnes-Holmes, & Moors, 2013). Arguments regarding the supremacy of taking a functional, structural, or operational approach to defining learning were prevalent in the first half of the 20th century (Kellogg & Britt, 1939; Washburne, 1936) and continue today. Illeris (2009) provided one comprehensive definition of learning: "any process that in living organisms leads to permanent capacity for change and which is not solely due to maturation or ageing" (p. 3).

Within the broad conceptual space associated with learning, we find constructs like perception, memory acquisition and retrieval, mental processing, reasoning, problem-solving, and others. Most researchers would agree that learning is a process that results in a change in knowledge, skill, or behavior based on experience derived from the learner's environment.

For the purposes of this chapter, learning is defined as a process in which people discover a problem, invent a solution to the problem, produce the solution, and evaluate the outcome, leading to the discovery of new problems – resulting in an increase, through experience, of problem-solving ability (Argyris, 1983; Washburne, 1936). Although learning is often seen as occurring at an individual level, it applies to teams or groups (Dayaram & Fung, 2012), as well as organizations (Kim, 1993).

Individual Level

Learning at the individual level is based on numerous theories that are supportive of this definitional approach (McLeod, 2003). For example, Piaget's theory of cognitive development was based on the fundamental notion that intellectual growth was the result of adaptation to the environment (Supratman, 2013). Piaget differentiated assimilation, using existing schemas to deal with newness, from accommodation – for situations in which the existing schemas do not work. The force that drives the learning is equilibration, which promotes integration of the existing with the new (Ayman-Nolley, 1988).

Dewey's theory of reflective thinking was based on the notion that learning is based on the experience of life adjustment to the environment (Archambault, 1966). The process of reflective thinking linked learning to sensing problems or gaps, thinking through suggestions or hypotheses, testing these, ultimately resulting in a postreflective stage in which the gap or problem situation is resolved (Dewey, 1933).

A more recent theoretical approach to learning is metacognition (Flavell, 1979). On an individual level, the degree to which people are able to provide explanations for how a problem may be solved and become more conscious of the problem-solving process is referred to as metacognition (Coutinho, Wiemer-Hastings, Skowronski, & Britt, 2005). Metacognition refers to higher-order learning processes such as making plans for learning, monitoring and predicting performance, and strategizing on approaches to solving problems – learning how to learn. The emerging theory of metacognition illustrates the importance of conscious awareness of cognitive activity within the individual and self-regulation of learning (Salonen, Vauras, & Efklides, 2005).

Group or Team Level

Even though it is most often considered an individual phenomenon, learning at the group or team level also has strong theoretical foundations (Levine & Resnick, 1993; Levine & Smith, 2013). Social learning theory is one of the most relevant here, in that learning is placed within continuous reciprocal interaction among cognitive, behavioral, and environmental influences (Bandura, 1977). In short, people learn from one another through observation and modeling.

Vygotsky's social development theory offers support for learning occurring within a group context (Frawley, 1997; Moran & John-Steiner, 2003). For Vygotsky, learning is more than the acquisition of thinking ability, it is the acquisition of a variety of specialized abilities and at particular developmental levels. The process of development does not coincide with learning – rather, it follows learning. He proposed the concept of the zone of proximal development as a way of explaining how people at different developmental levels can affect each other's learning through collaboration with peers or interaction with adults (Cole, John-Steiner, Scribner, & Souberman, 1978). For Vygotsky, human learning is a social construct, and it influences problem-solving and creativity (Lindqvist, 2003).

Social metacognition is an extension of individual metacognition and includes group members' monitoring and control of each other's knowledge, emotions, and actions (Chiu & Kuo, 2009). What we think about our own thinking is inextricably linked to experiences with others, ongoing social interactions, and cultural backgrounds (Jost, Kruglanski, & Nelson, 1998; Salonen, Vauras, & Efklides, 2005).

Organizational Level

Learning also occurs at the organizational level (Argyris, 1999; Argyris & Schon, 1995). Organizational learning can be conceived as a principal way for organizations to achieve strategic renewal by balancing the demands for both

exploitation and exploration (Crossan, Lane, & White, 1999). Popova-Nowak and Cseh (2015) defined organizational learning as "a social process of individuals participating in collective situated practices and discourses that reproduce and simultaneously expand organizational knowledge" (p. 316).

The sensemaking perspective provides further support for learning occurring at the individual, team, and organizational levels (Weick, 1969, 1995). Maitlis and Christianson (2014) defined sensemaking as a process that is initiated through violated expectations stemming from the environment that yield intersubjective meaning. This meaning is derived from cycles of interpretation and action.

Since the environment is chaotic and uncertain, sensemaking is more about plausibility, rather than certainty when it comes to learning (Weick, Sutcliffe, & Obstfeld, 2005). It is also about dynamic and continuous learning. Given the volatile and ambiguous nature of life in organizations, sensemaking has also been related to ethical decision-making on the part of leaders (Thiel, Bagdasarov, Harkrider, Johnson, & Mumford, 2012). Since sensemaking takes a process-oriented approach to explain how people deal with complexity, novelty, and opacity, it has also been linked directly to organizational creativity (Drazin, Glynn, & Kazanjian, 1999).

The theory of situated cognition provides additional support for learning occurring at the organizational level (Elsbach, Barr, & Hargadon, 2005; Robbins & Ayded, 2009; Smith & Semin, 2004). Situated cognition focuses on the interaction between mental representations or schemas and the context. Rather than being stable, these schemas are extremely malleable and sensitive to details of current social situations (Smith & Semin, 2007). Schemas are derived from activities like environmental scanning and interpretation that construct perceptual frameworks to enable comprehension, understanding, and the taking of effective action. Lave (2009) described situated cognition as a dynamic system that centers on diverse people who improvise solutions stemming from the context, and seek to collaboratively define the situation.

Creativity

It would take volumes to adequately review and summarize the variety of definitions of creativity. The best single book I know that provides a rather comprehensive explanation is 555 pages (Sawyer, 2012). There is, however, emerging consensus that creativity can be defined as the production of new (original, novel) and useful (high-quality, elegant) ideas and solutions by individuals and groups (Amabile & Pratt, 2016; Mumford, Medeiros, & Partlow, 2012).

Creativity, defined this way, can occur at different levels of impact. At the highest level of impact is the rare realm of the eminent genius that is recognized historically as transformational, often referred to as "Big C" creativity

(Simonton, 2014, 2017). The next level is referred to as "Pro-C" and includes solid creative contributions by professionals who have obtained high levels of expertise but are not recognized historically as eminent (Kaufman & Beghetto, 2009). A third category is called "little c" and includes everyday creativity – outcomes that are acknowledged by others as new and useful but in which the average person can participate (Richards, 2007).

A final category is called "mini-c" and resides at the individual level. It includes a personal creative process involving the development of new understanding and knowledge creation (Beghetto & Kaufman, 2007). Mini-c creativity represents early stage creativity and can be most closely related to learning as it focuses on the interpretive and transformative aspects of information processing that occur at the individual level (Moran & John-Steiner, 2003).

Many of the theories outlined for learning have also been identified to support creativity. An early review of creativity theory (Roweton, 1970, p. 15) asserted that "no fully matured and comprehensive theoretical statement is available." It is well beyond the scope of this chapter to provide a comprehensive review of creativity theory, as there are plenty of other resources that do so (Beghetto & Kaufman, 2017; Kozbelt, Beghetto, & Runco, 2010; Paletz & Peng, 2008; Plucker, 2017; Runco, 2014; Runco & Albert, 1990; Treffinger, Isaksen, & Firestien, 1983). These reviews vary in the way they categorize creativity theories and their focus on people, process, product, or place, yet there are a few major similarities.

One example is the theory of creativity offered by Carl Rogers (1962). His theory is primarily aimed at explaining the creative process. He stated the following:

> My definition, then, of the creative process is that it is the emergence in action of a novel relational product, growing out of the uniqueness of the individual on the one hand, and the materials, events, people, or circumstances of his life on the other. (p. 65)

He linked the need for creativity to societal demands, laid out inner and environmental conditions that foster creativity, and identified a series of hypotheses that would put the theory to work. As with many other theories of creativity, Rogers (1962) places creativity at the intersection of the individual with his or her environment and emphasizes the role of process.

One family or category of creativity theory is referred to as cognitive, rational, and semantic. It includes those theories that outline certain cognitive skills and abilities associated with creativity (Guilford, 1959; Mumford & Gustafson, 1988; Ward, Smith, & Vaid, 1997), theories of mental association (Koestler, 1964; Mednick, 1962; Rothenberg, 1971), how language is linked to thinking and problem solving (Lakoff & Johnson, 1999; Ogden & Richards,

1927; Upton, 1941), and those who put forward a phasal notion of the creative process (Hadamard, 1945; Rossman, 1931; Wallas, 1926). This family of creativity theory is most closely associated with the main purpose of this chapter.

Summary

We can draw a number of conclusions about learning and creativity from these multilevel theoretical perspectives. First, learning involves continuous dynamic interaction and experience between individuals and their environments. The interaction is both external and internal to the individual via acquisition and elaboration among other developmental and cognitive activities (MacKinnon, 1970). Second, learning can be conceived as a dynamic process capable of a conceptual link to problem-solving. Finally, learning, by itself, is value neutral. It can be derived through both success and failure. Each of these conclusions is dealt with in more detail in the following sections of this chapter.

Learning Is Linked to Problem-Solving and Creativity

The definitions and theories summarized earlier provide clear conceptual support for including problem-solving as related to both learning and creativity. For example, Torrance and Torrance (1973) illustrated the close conceptual link between problem-solving and creativity by emphasizing the process of

> …becoming sensitive to problems, gaps in knowledge, missing elements, disharmonies, and so on; identifying the difficulty; searching for solutions, making guesses or formulating hypotheses about the deficiencies; testing and retesting these hypotheses and possibly modifying and retesting them; and finally communicating the results. (p. 6)

Guilford (1977) defined problem-solving as facing a situation with which you are not fully prepared to deal. Problem-solving occurs when there is a need to go beyond the information given; thus, there is a need for new intellectual activity. Creativity and problem-solving were closely related since both demand novel responses. Newell, Shaw, and Simon (1967) added further support for linking problem-solving to creativity. They put creativity as a special class of problem-solving characterized by novelty and difficulty in problem formulation.

Both Learning and Creativity Often Start with the Individual

A great deal of research and practice focuses on understanding and nurturing learning and creativity at the individual level of analysis. Even at this level,

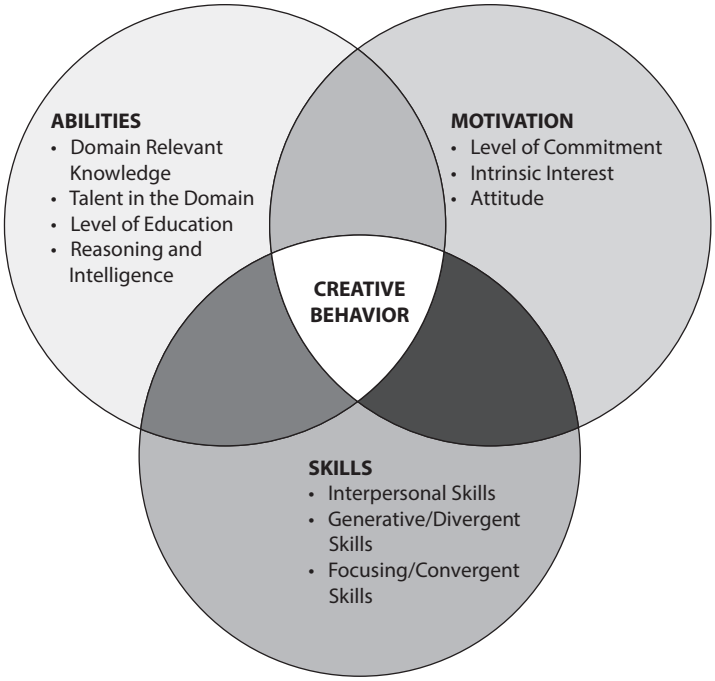

FIGURE 14.1 A model for predicting creative behavior.

conceptualizing, developing, and predicting creative behavior are multidimensional and have multilevel implications. For example, both Amabile (1983) and Torrance (1979) proposed multidimensional models for predicting creative behavior (see Figure 14.1).

Abilities include domain-relevant knowledge, talent in the domain, level of education, as well as reasoning ability and intelligence. Motivation includes the level of commitment to the task, intrinsic interest, appropriate extrinsics, and attitude. Creativity-relevant skills include generative or divergent skills, focusing or convergent skills, as well as interpersonal or collaborative skills. The best way to view creative behavior is as an interaction among these areas – for the individual, group, or team, and at the organizational level of analysis.

Learning and Creativity Stem from Experience: Including Failure

Creativity and learning occur at the intersection of the individual and the environment. We can consider creativity and learning as continuous, iterative, and dynamic processes that integrate experience, cognition, and behavior (Kolb, Boyatzis, & Mainemelis, 2001). Experiential learning transforms experience into learning (Akella, 2010) and creativity (Gundy & Kickul, 1996)

and has important implications for management and leadership within organizations (Kolb & Kolb, 2009a).

Experience, as it relates to both learning and creativity, can be perceived as positive or negative. Some argue that learning and creativity are stimulated by dissatisfaction or frustration by things that are inconsistent with our expectations or hopes (Schein, 1996). Since creativity applies to those situations demanding both novelty and usefulness, it is clear that error will be prevalent (Bledow, Carette, Kühnel, & Bister, 2017; Hammond & Farr, 2011; Mumford, Blair, Dailey, Leritz, & Osburn, 2006). In fact, trial and error are inseparable from learning and creativity (Reason, 1990, 2013). Failure is inextricably linked to both learning and creativity at the individual (Sitkin, 1992), group or team (Carmeli, Tishler, & Edmondson, 2011), and organizational levels (Cannon & Edmondson, 2005). Although failure is intricately linked to an organization's creative efforts, learning from failure can be challenging at the individual, group or team, and organization levels.

Failure can be considered any deviation from expected and desired results (Cannon & Edmondson, 2005). There is quite a broad range of failure within organizations: preventable failures in predictable operations that may be blameworthy, unavoidable failures in complex systems, and intelligent failures at the frontier (Edmondson, 2011). The two latter forms of failure require something other than locating blame and taking immediate short-term corrective actions.

A range of emotions can be felt by individuals who fail, including denial, anger, personal pain and embarrassment, sadness, dismay, worry, anxiety, frustration, and depression (Shepherd, Patzelt, & Wolfe, 2011). The emotions associated with failure can lead to defensiveness and denial. Numerous factors can mitigate these negative emotions. Shepherd, Patzelt, and Wolfe (2011) found that an individual's level of affective commitment or identification with and involvement in an organization can decrease the negative emotions associated with failure. They also found that individuals learned more from project failures if they had more time following the event to engage in learning. Finally, they found that learning from failure was more likely, and negative emotions were less apparent, if the work environment normalized failure.

How individuals receive feedback about their failures can impact their learning (Cannon & Witherspoon, 2005). For example, He, Yao, Wang, and Caughron (2016) found that feedback from supervisors can actually increase creativity when the recipients have a strong learning-goal orientation. Learning can be stimulated when both the giving and receiving of failure feedback are effective and take place within an organization that is developmental (Kegan, Lahey, & Fleming, 2014).

Of course, there are many factors within the individual and context that influence the readiness and ability to learn from failure (Zhao, 2011). Politis and Gabrielsson (2009) examined why some entrepreneurs had more positive

attitudes toward failure than others. They found that entrepreneurs' favorable attitudes toward failure were a function of earlier life experience – particularly with start-ups and having to close down a business earlier in their career. These experiences may have increased individual levels of self-efficacy, which has been shown to affect creative performance over time (Tierney & Farmer, 2011).

Amabile and Pratt (2016) reported that a high degree of psychological safety can lead to increased intrinsic motivation and reengagement in the creative process in the face of project failure. Psychological safety was a shared sense that it was acceptable to fail and make mistakes because they are treated as opportunities to learn and improve – and did not include derision of the individuals involved.

Bledow, Carette, Kühnel, and Bister (2017) pointed out the importance of high error orientation in learning from stories of managerial failure. High error orientation was defined as a complex attitude toward failure in which individuals can acknowledge that failures are negative but also have positive learning consequences. Failure stories produced deeper levels of information processing and higher levels of learning transfer than success stories. Error orientation moderated this relationship such that those with higher error orientations (those who saw the learning potential of failures) showed more elaboration and learning transfer when listening to failure stories.

Experience occurs at a group or team level through collaboration and interaction, and the nature of this experience can affect the ability of groups to learn from mistakes and failures. Cannon and Edmondson (2001) found that teams within the same organization held different beliefs about failure, and these beliefs were associated with levels of performance. They found that those groups that had clear direction for their efforts, and proximal leaders who were effective coaches, had more constructive beliefs about learning from failure and higher levels of performance.

The nature of the collaboration and interaction at a group or team level can also influence the level of learning from mistakes. Tjosvold, Yu, and Hui (2004) found that team-level learning from mistakes can be encouraged by psychological safety, shared mental models, as well as sharing a problem-solving orientation and working within a cooperative goal structure. Cooperative goal structures for teamwork were compared against competitive goal structures and found to be a better foundation for the problem-solving interaction that helped teams learn from mistakes. They indicated the following:

> Problem solving where team members recognize that mistakes can help them improve and together analyze, discuss, and plan how to correct them, was found to be an important antecedent of learning from mistakes from both the perspective of group members and their managers. (p. 1238)

One of the most dramatic differences between innovative and stagnated organizations is their tolerance of ambiguity and uncertainty, referred to as a climate dimension of risk-taking (Ekvall, 1996). In fact, Garcia-Granero, Llopis, Fernandez-Mesa, and Alegre (2015) demonstrated that a risk-taking climate among employees mediated the relationship between managers' risk-taking and innovation performance of the organization. This suggests that establishing this kind of organizational climate may also encourage learning from failure.

Cannon and Edmondson (2005) differentiated small from large failures. They argue that small failures provide early warning signs that if detected and addressed may be instrumental in avoiding larger and more catastrophic failures in the future.

If the aim is to learn from failure, Cannon and Edmondson (2005) outline three main organizational strategies. The first of these is actually and deliberately identifying failure rather than denying, distorting, or covering up the reality of failure. Systematically and proactively identifying failures – small and large – is the first step in learning from failure. The second strategy is analyzing the failure requiring a spirit of inquiry and openness, patience, and a tolerance for ambiguity. Examples include the U.S. Army's use of after-action reviews or morbidity and mortality conferences in healthcare. Analyzing failure can be encouraged through formal processes for discussing, analyzing, and applying the lessons of failure more broadly within the organization. Cannon and Edmondson (2005) recommend that these formal processes should be conducted by skilled facilitators who have skills and tools for effectively managing group processes.

Cannon and Edmondson (2005) describe their third active organizational process for learning from failure as deliberate experimentation. They acknowledge that this may be provocative as organizations may actually increase their chances of experiencing failure by experimenting. Of course, this implies that leaders in organizations accept that failure is a necessary by-product of experimenting and that they are able to manage the risks to acquire the benefit of learning (Edmondson, 2011).

Although individuals and teams appear to be influenced most directly by proximal leaders (i.e., direct supervisors), top management teams (TMTs) and chief executive officers (CEOs) often set the tone for the entire organization. Carmeli, Tishler, and Edmondson (2011) studied how CEOs and TMTs improved the quality of strategic decision-making by creating trust and facilitating learning from failure. Strategic decision-making is often uncertain and ill structured and conducted by diverse senior teams. Carmeli et al. (2011) found that CEOs who encouraged collaboration and open communication established top-team trust that, in turn, increased team learning from failure. As senior teams invested in learning from failure, their strategic decision-making improved.

Collaboratively and deliberately framing problems and opportunities for improvement, cooperatively generating ideas and suggestions for addressing these, and ultimately taking actions to implement these ideas, can lead to more productive individuals, teams, and organizations. Doing this within a supportive work environment and with relational leaders and facilitators can help organizations learn more productively from both success and failure (Kvalnes, 2017). CPS offers one productive framework and approach for doing so.

Creative Problem-Solving

If you were to Google the term *creative problem-solving*, you would find nearly 45 million results. This search would include a wide variety of conferences, organizations, tools and techniques, methods and processes, journals, books, and other resources. In keeping with the purpose of this chapter, we focus on one main family of work – starting with the foundational work of Alex Osborn (1948, 1952, 1953). The versions of CPS upon which we focus include those starting with Osborn's initial description, and the later modifications provided by Parnes (1966a, 1967) and Parnes, Noller, and Biondi (1977). These versions are referred to as the Buffalo-based CPS approach.

CPS is a broadly applicable process providing an organizing framework for specific generating and focusing thinking techniques to help design and develop new and useful outcomes for meaningful and important challenges, concerns, and opportunities (Isaksen, Dorval, & Treffinger, 1994). CPS is an operational model for a particular kind of problem-solving where creativity is applicable for the task at hand, particularly a task that is novel, complex, and ambiguous.

Noller (1977) defined CPS by offering a definition of each of the three main words: creative, problem, and solving:

> By creative we mean: having an element of newness and being relevant at least to you, the one who creates the solution. By problem we mean: any situation which presents a challenge, offers an opportunity, or is a concern to you. By solving we mean: devising ways to answer or to meet or satisfy the problem, adapting yourself to the situation or adapting the situation to yourself. Creative Problem Solving or CPS is a process, a method, a system for approaching a problem in an imaginative way resulting in effective action. (pp. 4–5)

Foundational Work on CPS

Although Osborn was a well-known businessman, his initial formulation of CPS was informed by the work of early scholars who attempted to outline an explicit creative process (1948, 1952, 1953). As a part of his graduate studies in

psychology, Osborn studied the works of James Conant, Robert Crawford, John Dewey, Ernest Dimnet, Johnson O'Connor, Charles Spearman, and Graham Wallas, among others. He outlined stages of the CPS process and procedures for both individuals and groups to engage in the process. His most well-known procedure was brainstorming, which he positioned as creative collaboration in groups.

Parnes and colleagues (Noller, Parnes, & Biondi, 1976; Parnes, 1966a, 1967; Parnes, Noller, and Biondi, 1977) built on Osborn's original work and created an eclectic experimental instructional program to see if it was possible to deliberately develop creative abilities and skills. The results of this two-year experimental program were quite promising (Noller & Parnes, 1972; Parnes, 1987; Parnes & Noller, 1972a,b; Parnes & Noller, 1973; Reese, Treffinger, Parnes, & Kaltsounis, 1976). This instructional program has become known as the Osborn-Parnes approach to CPS and is well established in the research activities of other scholars (Basadur, Graen, & Green, 1982; Buijs & Nauta, 1991; Cramond, Martin, & Shaw, 1990).

Lessons from Experience

The Osborn-Parnes approach was widely disseminated through publications, conferences, and training programs (Parnes, 1977). Numerous organizational consultants and trainers applied CPS, and some modifications (Basadur, Graen, & Green, 1982), to organizational challenges. However, based on a variety of impact studies and experiences within diverse organizations, several major developments were made to the Osborn-Parnes approach. There were clear benefits derived from sustained collaboration, blending research and practical applications in organizational contexts that challenged some aspects of early work on CPS. Many of these are well documented in the literature (Isaksen & Treffinger, 2004; Puccio, Murdock, & Mance, 2005; Puccio & Cabra, 2009; Treffinger & Isaksen, 2005). A few of these key lessons are summarized next.

Balancing Generating with Focusing

One of the first lessons from experience was that the preponderance of CPS tools and techniques were divergent, helping people to generate many, varied, and unusual alternatives. This focus helped to shore up a common misconception that CPS was equivalent to idea generation or brainstorming. There was a clear need to move beyond generating and include tools and techniques to help people screen, select, and support options (Gibson & Mumford, 2013). We undertook efforts to develop a balanced set of focusing tools to complement the generating tools (Isaksen & Treffinger, 1985). Further, there were clear guidelines for generating – the four basic rules for brainstorming. Yet, there

were no guidelines for effective focusing or convergent thinking. Parallel focusing guidelines were developed and integrated into the CPS development programs (Treffinger, Isaksen, & Firestien, 1982).

Moving from Prescription to Description

The Osborn-Parnes approach presented the CPS process as a linear, predefined series of stages. Impact studies within organizations challenged this notion (see Isaksen & Treffinger, 2004, for a summary). Instead, the clear feedback was that real-life application of CPS was much more flexible and iterative. People used the stages and tools that were needed for specific applications, rather than "running through" the entire prescribed process. When they described their most frequent applications, they fell into three broad categories: seeking clarity, generating ideas, and planning for action.

Navigating the Open System

When CPS was considered a prescribed series of stages with clear starting and ending points, there was no need to consciously choose where to start. Once the stages were clustered and broken into three major components, we needed a way to consciously plan our approach – link the particular need with the appropriate parts of CPS and design its specific application. This resulted in the development of a management component of CPS called Planning your Approach (Isaksen, Dorval, & Treffinger, 2000).

Clarifying Social Roles

Experience in applying CPS within large, complex organizations challenged the notion that you could train everyone involved, and then simply apply the CPS process. Osborn (1953) had already pointed out that effective application of CPS required someone who was trained in the approach and prepared to manage group dynamics. Three major social roles were defined to guide the effective application of CPS (Isaksen, 1983, 1992, Treffinger, 1983). Process-oriented leadership is provided by a trained facilitator (Parnes, 1985). The person who owns the task is called the client. Others who may be involved in a CPS session are referred to as resource-group members and bring diverse expertise to the task.

Current CPS Framework

As a contemporary framework, CPS integrates learning, creativity, and problem-solving. Creativity emphasizes the search for newness and the

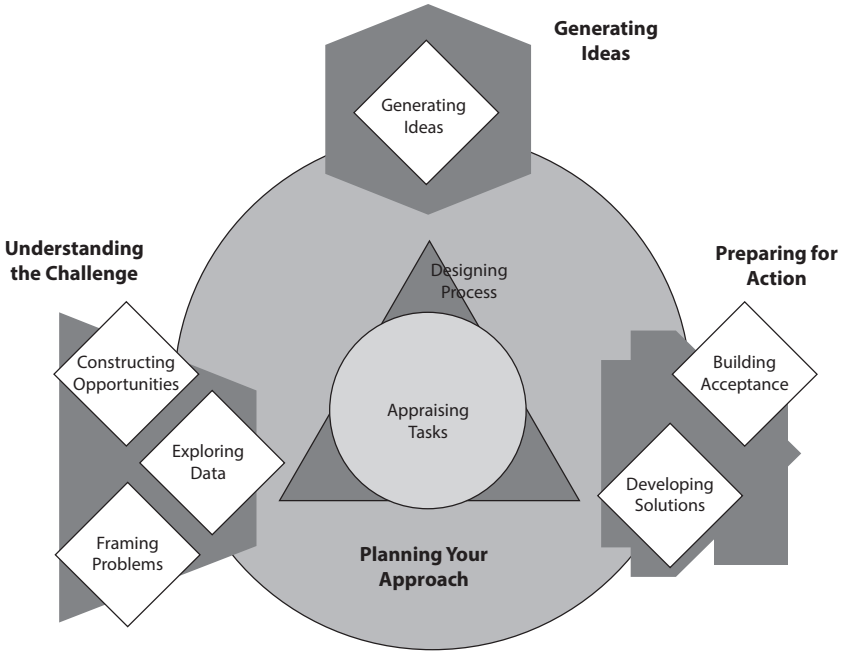

FIGURE 14.2 The current creative problem-solving model.

deliberate generation and development of many and varied alternatives. Problem-solving emphasizes the development of useful and relevant solutions.

The current CPS framework helps to achieve clarity, generate ideas, and take action (Isaksen, Dorval, & Treffinger, 2011). Since these are three distinct choices and areas into which the tools, guidelines, and language of CPS coalesce, you need to be able to navigate your way through its various components and stages. Navigation is obtained by a component called Planning your Approach. Clarity is achieved by Understanding the Challenge. Many, varied, and original ideas are obtained by a component called Generating Ideas. The Preparing for Action component includes strengthening potential solutions and developing plans of action. These main components of CPS are described in more detail in the following sections (see Figure 14.2).

Planning Your Approach

The current version of CPS includes a unique management component called Planning your Approach, that focuses on producing the desired results, as well as considering the people involved, considering the climate within the organization, and designing the appropriate process approach (Isaksen, Dorval, & Treffinger, 2000; Treffinger, Isaksen, & Stead-Dorval, 2006). The purpose of

this component is to help you navigate your way through the application of the CPS process.

Planning Your Approach contains two main stages: *Appraising Tasks* and *Designing Process*. These stages deal with the deliberate management of the other components within CPS. Since we need to be able to personalize and customize CPS for many different applications, these stages help you to determine if CPS is an appropriate method and, if it is, to design an effective application of the components, stages, language, and tools.

Appraising Tasks

Task appraisal involves determining whether or not CPS is appropriate for a given task, and whether modifications of your approach might be necessary. During task appraisal, you consider the key people, the desired outcome, the characteristics of the situation, and the possible methods for handling the task. Task appraisal enables you to assess the extent to which CPS might be appropriate – the method of choice, as it were – for addressing a given task or for managing creativity in appropriate ways.

When appraising a task, we consider the following:

People: A key part of the system is to ensure that the proper level of ownership (interest, influence, and imagination) and sponsorship are in place. Engaging people in CPS without clear and legitimate ownership can be a waste of time, energy, and resources. A key decision point when appraising a task is to ensure that you are working with a client – someone who owns the task. It is also helpful to understand the abilities, motivations, skills, and styles of the people who will be involved in CPS.

Place: The climate, working atmosphere, and culture are important factors influencing your approach to CPS. Considering the context can help you understand if the context is ready, willing, and able to use a particular method. Since CPS takes an investment of energy, appraising tasks helps to determine the level of priority that should be assigned to a specific task. A great deal of research has been done to understand the climate that supports creativity and innovation, and climate assessments can be used to supplement your understanding of the context (Ekvall, 1996; Hunter, Bedell, & Mumford, 2007).

Desired Outcomes: Having a clear image of the desired results is key to successful application of CPS. Attention is focused on the domain-relevant knowledge of the current reality when appraising a task. This is where having a client with appropriate content expertise is important. By understanding the desired outcome or need, you are in a much better position to validate the need for novelty. After all, if there is no real need for newness, there is no need to apply CPS.

The current approach to CPS requires the development of a written task summary that clearly points out the need for originality and the requirements for the outcomes, including key background information. This statement guides the specific application of the tools and language and helps everyone understand the purpose of the session, project, or initiative. Task summaries act as springboards for effective problem-solving and ensure delivery of desired outcomes.

Methods: Since CPS is an open system, it allows for the integration and use of a number of alternative methods. The information gained from an improved understanding of the people, context, and outcomes guides the choice to use CPS or integrate other methods within your approach. CPS is best applied when you are approaching a novel, complex, and ambiguous situation for which there is no solution currently available.

Designing Process

As a result of appraising tasks, you are in the position to design your process approach. This stage includes considering the scope of your work. Will it be a single session, a longer-term project, or an even larger and longer-term initiative? Is the level of your application targeted to an individual, group or team, or at an organizational level? And then, which of the components or stages of CPS will be most helpful?

Once you have determined the scope and level of application for CPS, you need to decide if the need is for clarity, ideas, or action. These are the main purposes of the three main process components of CPS. You may sense a gap between current reality and the desired future but not have a clear understanding of the opportunity or problem. In this case, you may benefit from the clarity component: understanding the challenge. If you have a clear statement of the problem but do not have ideas to address the problem, then the generating ideas component would be a good fit. If you have a tentative solution that needs to be strengthened for implementation and acceptance, the planning for action component would be appropriate.

Sample Application of Planning Your Approach

A large, global consumer products company had developed a very clear screening process for new product concepts. The competition was developing and launching new products much faster in key market segments. We were invited to be the lead and coordinating consultants on Project Discovery. The goal was to obtain new and different concepts for the laundry, soap, and paper sectors. The project was designed using appraising tasks and a designing process allowing the use of five alternative methods to obtain consumer insight. Within 18 months, the company went from having just 25 product

concepts (developed over seven years) to 76 new and fundamentally different product concepts that were capable of being tested in the market. The project proved to be so successful that the methods are being taught to everyone who works in product development and research.

Understanding the Challenge: Clarity

The *Understanding the Challenge* component includes a systematic effort to define, construct, or focus your problem-solving efforts. This component deals with the natural structural tension (Fritz, 1993) that arises when there are discrepancies between what you want or desire, and what you have – or current reality.

Understanding the challenge includes the three stages of *constructing opportunities*, *exploring data*, and *framing problems*. Constructing opportunities involves generating broad, brief, and beneficial statements that help set the principal direction for problem-solving efforts. We use invitational stems like "Wouldn't it be great if…" or "Wouldn't it be awful if…" These statements are framed at a rather high level of abstraction to point out the boundaries of the domain (Ogden & Richards, 1927; Upton, 1941). This stage focuses on helping to identify broad goals at a strategic level phrased as both opportunities and obstacles. This helps you identify your vision, as well as, key barriers or discrepancies to accomplishing it.

Exploring data includes generating and answering questions that bring out key information, feelings, observations, impressions, and questions about the task. This emphasis on information processing helps problem-solvers to develop an understanding of the current situation. Exploring data helps you obtain a deeper understanding of the current reality within the context of the opportunity or problem space.

Framing problems involves seeking specific or targeted questions (problem statements) on which to focus subsequent efforts. The questions are framed using language like "How to…" or "In what ways might we…" as invitational stems. Framing problems is related to the concept of problem finding, which is well described in the creativity literature (Dillon, 1982; Getzels & Csiksentmihalyi, 1976; Runco, 1994).

Sample Applications of Understanding the Challenge

A global university publisher needed to focus their efforts on increasing sales and market share for one of their major divisions. By applying constructing opportunities, the division was able to generate more than 200 opportunity statements and ended up focusing these down to seven key areas for investment and development. By prioritizing these initiatives, they were able to develop

specific action plans much faster and more cheaply and to involve many more stakeholders in the process than in earlier efforts.

A global consumer products company needed to develop some fundamentally new products within one of their major divisions. By applying a Deep Dive Discovery approach to exploring data, they were able to obtain very original insights into consumer needs, and a deeper meaning of what these needs implied, resulting in a significantly improved use of their technology and marketing efforts.

One of our clients produces high-tech medical solutions. By applying framing problems tools to acquire consumer insight, the client was able to redefine their initiative to reengineer their anesthesia equipment. The company ended up with a substantial cost savings and was able to develop a new add-on piece of equipment usable on new and existing machines.

Generating Ideas

When you have a well-defined problem space but lack ideas to address the issue, the *Generating Ideas* component and stage help you come up with many, varied, or unusual options for responding to the problem. During the generating phase of this stage, problem-solvers produce many options (fluent thinking), a variety of possible options (flexible thinking), novel or unusual options (original thinking), or a smaller number of detailed or refined options (elaborative thinking). The focusing phase of generating ideas provides an opportunity to examine, review, cluster, and select promising ideas. Although this stage includes a focusing phase, its primary emphasis rests in generating or the commitment of extended effort to seek creative possibilities (Basadur & Thompson, 1986; Parnes, 1961).

CPS has often been equated with generating ideas and brainstorming. As I have pointed out, brainstorming is only one tool within the CPS framework. Although there was some early evidence that supported the use of brainstorming (Parnes & Meadow, 1959; Parnes, Meadow, & Reese, 1959), one early study (Taylor, Berry, & Block, 1958) compared nominal versus real groups and concluded that group participation inhibited creative thinking. For Osborn (1953) brainstorming was never meant to exclude individual ideation. In fact, he encouraged participants who were to be involved in brainstorming sessions to generate ideas before joining the group.

Brainstorming research that followed provided insight into the barriers for the effective use of the tool. Numerous studies pointed out the negative influence of uniformity pressure and evaluation apprehension (Diehl & Stroebe, 1987; Vroom, Grant, & Cotton, 1969). Social loafing, matching of effort, or the sucker effect also limited the effectiveness of brainstorming (Henningsen, Cruz, & Miller, 2000; Paulus, 1983). A third key barrier was the structure of the interaction, production blocking, or procedural mechanism

effect (Bouchard, 1972; Gallupe, Bastianutti, & Cooper, 1991; Mullen, Johnson, & Salas, 1991).

Brainstorming research has focused on two key ways to mitigate these barriers. The first is the use of technology such as group decision support systems or electronic brainstorming (Cooper, Gallupe, Pollard, & Cadsby, 1998; Thompson & Coovert, 2002). Nunamaker, Briggs, Mittleman, Vogel, and Balthazard (1997) shared lessons from their experience in using technology to support brainstorming and concluded that it: "can make a well-planned meeting better, and it can make a poorly planned meeting worse…any tool is only as good as the artisan who wields it" (pp. 171–172). The use of technology does not replace the need for group leadership.

The second major way to overcome these barriers is to use trained facilitators. CPS groups using trained facilitators did better than groups without one, and facilitated groups can actually match or exceed the productivity of nominal groups (Offner, Kramer, & Winter, 1996). Oxley, Dzindolet, and Paulus (1996) reported similar findings when studying the level of training of the facilitator. They found that the groups having the benefit of a highly trained facilitator outperformed nonfacilitated groups and those helped by facilitators with less training. They concluded that groups with a highly trained facilitator may achieve the productivity of nominal groups without foregoing the advantages of interaction. Isaksen and Gaulin (2005) confirmed these findings.

So much work within organizations must be done in teams and groups. Sutton and Hargadon (1996) critiqued brainstorming research based on the heavy use of non-sense tasks, ideas not actually being used, no appropriate training in the tool, and the use of average quality as a key metric. Real groups engaged in productive brainstorming should actually produce many low-quality ideas, as well as a larger number of higher-quality ideas. Average quality should be replaced or supplemented by assessing the number of high-quality ideas.

Sample Application of Generating Ideas

A global direct marketing/publishing company has applied tools for generating ideas to "turbocharge" their use of focus groups, resulting in substantially better insights from consumers. In addition, they have used these tools to help a major global division generate fundamentally different product ideas, to help them generate hundreds of new media and marketing channel ideas, and to generate ideas for consideration in their three-year planning process. All were aimed at helping them grow their core business.

Preparing for Action

Problem-solvers use the *Preparing for Action* component to make decisions about, develop, or strengthen promising alternatives, and to plan for their

successful implementation. The two stages included in the component are called *developing solutions* and *building acceptance*.

During developing solutions, promising options may be analyzed, refined, or developed. If there are many options, the emphasis may be on compressing or condensing them so that they are more manageable. If there are only a few promising options, the challenge may be to refine, strengthen, or develop each one to make them as strong as possible. This stage can involve ranking or prioritizing a number of possible options, generating and selecting specific criteria for evaluating promising options, or selecting the most promising options from a larger pool. The emphasis in this stage is primarily on focusing options and developing promising ideas into plausible solutions. This stage of CPS transforms the potential solutions into more workable and implementable concepts.

The building acceptance stage involves searching for potential sources of assistance and resistance and identifying possible factors that may influence successful implementation of solutions. The aim is to help prepare solutions for improved acceptance and greater value. This stage helps the problem-solver identify ways to make the best possible use of assisters and avoid or overcome possible sources of resistance. By considering these factors, problem-solvers can develop and evaluate a plan of action. Preparing for implementation also provides opportunities to consider alternative possibilities, contingency plans, or feedback loops.

Sample Application of Preparing for Action

A major manufacturing company needed to obtain more value from their research and development (R&D) investment decisions. The senior management team worked with CPS tools for developing solutions in order to generate and then prioritize the criteria for new product development investment projects. This diverse management team reached a clear consensus on their top 10 criteria for investment and made swift changes to the projects currently under consideration.

A global professional services consulting firm needed to speed up the development and launch of new services. The firm was able to decrease its time to market from 18 to 3 months by applying CPS building acceptance tools to a new suite of service offerings. This resulted in creating and maintaining increased market share.

Learning and Applying CPS

There are a number of key issues relating to learning and applying CPS. One of these is the role of expertise. It is possible, and perhaps even more desirable, to see expertise from both content and process perspectives. People can have

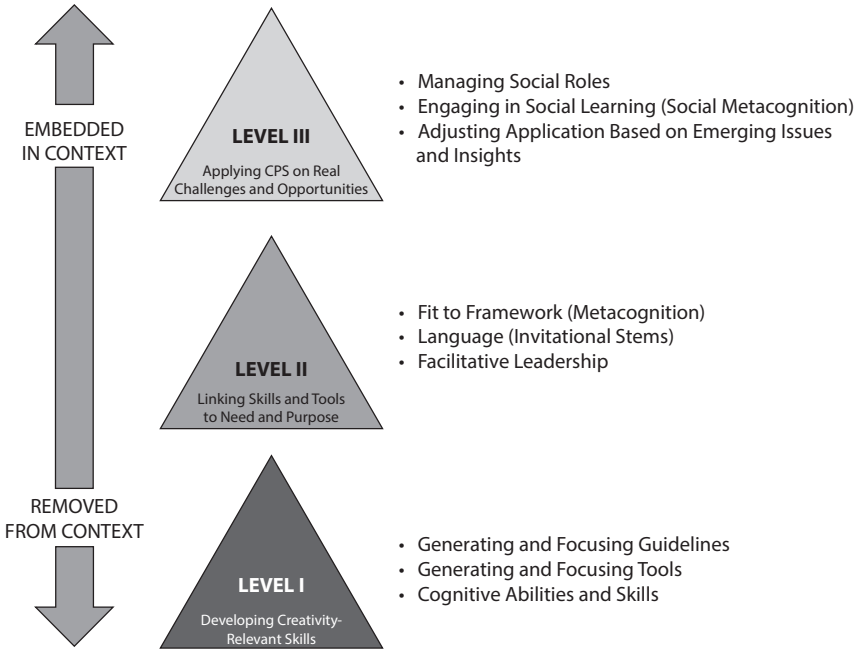

FIGURE 14.3 A model for learning and applying creative problem-solving.

extensive knowledge or ability based on research or experience in both a content domain and a managing process. Second, when engaging in CPS, both cognitive and affective issues matter. Further, since CPS requires conscious attention to thinking and planning problem-solving activity, it requires metacognition and social metacognition. Building CPS process expertise to unleash the creative talent within organizations is generally undertaken at multiple levels of activity (see Figure 14.3). In order to apply CPS to real challenges and concerns, we have found two additional and foundational levels of learning beneficial. The first of these focuses on learning creativity-relevant guidelines, skills, and tools. The next involves linking these to need and purpose, and using the language that best fits these. The next few sections elaborate on these and outline the dynamics involved in learning and applying CPS.

Expertise: Content and Process

Some creativity theorists argue that creative performance is domain specific, rather than being rooted in general domain-transcending traits or skills (Baer, 1998, 2012a,b). One implication of this domain-specific approach is that general cognitive-creative skills may not transfer to other task or content domains (Baer, 2011). Other theorists argue for the existence of general

creativity-relevant skills that can be broadly applied at the individual, group, and organizational levels (cf. Amabile & Pratt, 2016).

There is no question that having domain knowledge that is organized in a way that is accessible and integrated enables experts to excel in numerous memory and problem-solving tasks (Wiley, 1998). Experts can recognize relevant features within tasks, infer missing information, represent problems better, and impose constraints to narrow the search for solutions. These aspects of expertise manifest across a variety of domains (Chi, Glaser, & Farr, 1998), and the acquisition of expertise has been explicitly linked to problem-solving (Ericsson, 2003). Yet, there are conditions in which domain-relevant expertise may inhibit creative thinking. In certain circumstances, expertise can function as a preconceived mental set and promote fixation, particularly in unstructured and ambiguous problem spaces (Wiley, 1998).

Groups and teams are more likely to generate novel and useful ideas when they have access to and share diverse knowledge, expertise, and information through interaction with team members with dissimilar expertise – as in cross-functional teams. Yet, there are difficulties and nuances when it comes to teams that contain highly dissimilar expertise (Huang, Hsieh, & He, 2014). Individuals with unique expertise may not be able to understand and use the expertise of others unless they engage in team-level knowledge-sharing practices. These practices involve expertise coordination such as socially shared cognitive processes, collaborative problem-solving, and team-level integration processes (De Church & Mesmer-Magnus, 2010a,b; Faraj & Sproull, 2000).

Content and domain-relevant expertise plays a key role in CPS. Many of our most impactful CPS applications have involved experts within their domains. Since these applications have been conducted across a variety of content domains, it seems reasonable that domain-relevant expertise could be complemented by general, process-relevant expertise. The debate between domain-specific and domain-general skills continues, yet the CPS framework and tools are ultimately applied within a domain – on real content.

Starting with the foundational work of Lewin (1947), Maier (1967), and others (Benne & Sheats, 1948; Zajonc, 1965), there has been recognition of the need of an integrative or facilitative function within groups. There is expansive literature that points out the importance of a facilitative role when working with problem-solving groups (Bostrom, Anson, & Clawson, 1993; Chilberg, 1989; Nelson & McFadzean, 1998; Wardale, 2013). There is also general consensus that a facilitator is a process-oriented leadership role requiring expertise in managing group dynamics and experience in methods and techniques that help groups function more effectively.

Osborn (1953) recognized this need for learning and applying CPS, as did Parnes (1985). Parnes (1985) defined the CPS facilitator as one who "draws out, reinforces, and thus facilitates the creative learning, development, and

problem solving of the people with whom he or she is working" (p. 1). He went on to elaborate on the desired qualities and specific responsibilities of the CPS facilitator. The majority of these deal with managing group dynamics and the CPS process. Research has supported the positive effects of trained facilitators on CPS performance (Isaksen & Gaulin, 2005; Kramer, Fleming, & Mannis, 2001; Offner, Kramer, & Winter, 1996; Oxley, Dzindolet, & Paulus, 1996). It seems reasonable to conclude that both content and process expertise can be valuable for learning and applying CPS.

Role of Metacognition

Cognition is the mental action or process of acquiring knowledge, understanding through thought, experience, and through the senses. It includes a variety of mental processes such as attention, memory, working memory, comprehension, judgment, evaluation, reasoning, and problem-solving.

The term *metacognition* means, literally, cognition about cognition or thinking about thinking (Flavell, 1979). Metacognition is related to a family of constructs called theory of mind (Flavell, 2004; Papaleontiou-Louca, 2008) and includes self-regulated learning (Donker, de Boer, Kostons, van Ewijk, & van der Werf, 2014), learning strategies (Weinstein & Mayer, 1986), and mindfulness (Langer, 2000; Weick & Putnam, 2006), among others.

Cognitive skills are required to perform a task, while metacognitive skills are required to understand how the task was accomplished. There are a variety of components to metacognition. Schraw (1998) outlines two major sets of activities within metacognition: knowledge of cognition and regulation of cognition. Knowledge of cognition includes three types of knowledge. The first is *declarative*. which is knowledge about oneself as a learner and the factors that influence one's performance. The second is *procedural* and includes knowledge about doing things such as heuristics and strategies. The third is called conditional metacognitive knowledge and includes knowing when and why to apply declarative and procedural knowledge.

Regulation of cognition includes three sets of skills that help individuals control their learning. The first is planning, which includes selecting appropriate strategies and allocating time and attention that affect performance. The second set of skills is called monitoring and includes one's conscious awareness and comprehension of task performance. The third is evaluating, which is when learners appraise the outcomes and efficiency of their learning.

Knowledge and regulation of cognition are interrelated, and they span a wide variety of subject areas and domains. Further to the domain specificity of creativity debate, there is some evidence that both components of metacognition are domain-general in nature (Donker et al., 2014; Scott & Berman, 2013; van der Stel & Veenman, 2010).

Metacognition has been linked to productive experiential learning (Kolb & Kolb, 2009b) and to successful problem-solving (Berardi-Coletta, Buyer, Dominowski, & Rellinger, 1995). The explicit integration of metacognitive skills into efforts to deliberately develop creativity has been sparse. Two exceptions are the work of Mumford and colleagues investigating mental models when engaged in CPS (Mumford et al., 2012) and Hargrove and Nietfeld (2015) who specifically investigated the impact of metacognitive instruction on CPS.

Setting the Stage for CPS

McCluskey (2000) pointed out that there are many factors that affect ability, willingness, and readiness to learn and apply CPS. Although CPS is based primarily on the cognitive, rational, and semantic theories of creativity, other factors influence its learning and application from both personal and situational points of view.

A variety of individual differences, beyond domain-relevant knowledge, are salient when learning and applying CPS. For example, problem-solving style has been shown to influence preferences and use of CPS skills (Basadur, Graen, & Wakabayashi, 1990; Isaksen & Geuens, 2007; Puccio, 1999). Personality factors such as creative self-beliefs (Karwowski, 2014), openness to experience (Karwowski & Lebuda, 2016), and creative self-efficacy (Puente-Diaz & Cavazos-Arroyo, 2017) will also have an effect. Affective factors (Isen, 1999) such as mood (Davis, 2009), psychological safety (Kark & Carmeli, 2009), and levels of passion and persistence (Grohman, Ivcevic, Silvia, & Kaufman, 2017) can also make a difference.

Individuals engaged in learning and applying CPS do not exist in a vacuum. Numerous situational factors have an influence. For example, the nature and quality of the work environment or climate will influence the degree to which people engage in creative behavior (Amabile, Conti, Coon, Lazenby, & Herron, 1996; Isaksen, 2017). Their physical location, such as geographical region, can also influence creative behavior (Van der Vegt, Van de Vliert, & Huang, 2005). Tellis, Prabhu, and Chandy (2009) identified national culture as having an influence as well.

CPS is often applied within groups and teams. There are numerous assets and liabilities to working in groups (Hargadon & Bechky, 2006; Kozlowski & Ilgen, 2006; Reiter-Palmon, Wigert, & deVreede, 2012). Part of setting the stage at the group level includes managing group dynamics, establishing trust and clear guidelines for creative collaboration, as well as clarifying roles to be taken during the collaboration (Bezrukova & Uparna, 2009) – the key responsibilities of a trained facilitator.

The model we use to guide the learning and use of CPS (see Figure 14.3) depicts the transition from cognitive learning of foundational tools and

guidelines that occur at a distance from a specific context, to metacognitive learning and social metacognitive learning – which are ultimately embedded within a domain-specific context or task.

Developing Creativity-Relevant Skills

Learning and applying CPS starts with developing creativity-relevant skills, guidelines, and thinking tools. The current approach to CPS is built on a foundation incorporating both creative and critical thinking (Treffinger, 2007). Creative thinking stems from encountering gaps, opportunities, and obstacles requiring the generation of meaningful new connections. Critical thinking stems from the need to examine these possibilities constructively, and then focus to refine, develop, and decide. These two kinds of thinking and behaving are considered mutually important and complementary. On this foundation, we provide clear guidelines that establish the basic conditions or group norms for both kinds of thinking.

The generating guidelines are to defer judgment, strive for quantity, build on each others' suggestions, and freewheel – share highly unique options. The focusing guidelines include the following: use affirmative judgment, be deliberate, consider novelty, and stay on course. The emphasis to deliberately consider novelty is important when focusing during CPS due to the natural tendency to select options that are immediately feasible (Rietzschel, Nijstad, & Stroebe, 2010). The rationale and application of these guidelines are detailed in Isaksen, Dorval, and Treffinger (2011).

This first level includes learning generating (divergent) and focusing (convergent) thinking tools. These tools tend to promote certain kinds of cognition for individuals and procedural metacognition for groups (Vernon, Hocking, & Tyler, 2016). Tables 14.1 and 14.2 present a description of these tools. Each of the CPS tools can be applied within groups, and by individuals with slight technique modification. The tools are also capable of being applied within entire organizations, particularly through their idea-management systems.

A great deal of research now informs us about the specific cognitive processes and skills that undergird each of these tools (Barrett et al., 2013; Mumford, Medeiros, & Partlow, 2012; Puccio & Cabra, 2009; Ward, Smith, & Vaid, 1997). Many aspects of CPS depend on a complex set of cognitive processes (Mumford, 2001; Mumford & Gustafson, 2007; Mumford, Mobley, Reiter-Palmon, Uhlman, & Doares, 1991; Puccio, Murdock, & Mance, 2005). Further, these creativity-relevant cognitive skills predict CPS performance beyond creative ability (Mumford, Supinski, Baughman, Costanza, & Threlfall, 1997).

For generating tools, some are more likely to produce exploratory or innovative outcomes, while others are more likely to produce developmental

TABLE 14.1 Creative problem-solving tools for generating options

Brainstorming: During Brainstorming, individuals think of options that address the topic (stated as an open-ended question) and share them aloud for the group. An individual records the options as stated in a visible place. In contrast to group discussion (where generating and focusing often happen together), during Brainstorming, critical analysis and development are temporarily suspended.

Brainstorming with Post-its: As in Brainstorming, group members generate options by sharing them aloud. However, instead of one person recording the options, group members record their own options on Post-it notes. An individual then collects the Post-it notes and places them on a flipchart or other visible space. This allows for a greater flow of options because you do not have one person attempting to write each option generated by the group. Also, because the Post-its are movable, options do not need to be rewritten, thereby increasing the efficiency of subsequent focusing activities.

Brainwriting: Brainwriting provides quiet time to group members as they generate options. Group members work individually and quietly to record their options on a Brainwriting worksheet. After generating three options, each group member exchanges the worksheet for another one lying in the middle of the workspace. The group member reads these options silently and uses them as stimuli to generate three additional options. Members can build on the options previously written or generate entirely new options. Repeat the exchange of the Brainwriting worksheets until they are completely filled, or until a stated time period has elapsed.

Brainstorming Enhancers: SCAMPER and Forced Fitting are tools to help people shift their perspectives and think about things from new directions. Forced Fitting requires an individual to force a relationship between a random object (e.g., a toy) and the task at hand. SCAMPER is a mnemonic device for a menu of thought-provoking questions that can be used to stimulate a shift in thinking.

Imagery Trek: The goal of Imagery Trek is to create new connections by taking a mental or physical journey, first away from a task and then connecting back to it. First, a list of words is generated. One word is selected and used to create an image. The image is used to stimulate "fuzzy" connections back to the task at hand. Finally, more concrete connections are made, which relate to the task.

Ladder of Abstraction: As the name Ladder of Abstraction suggests, this tool consists of moving up and down different levels of abstraction in a systematic way. Asking the question "Why," about a task, helps to identify a broader view or a higher level of abstraction. Asking "How," leads to a more specific or concrete view of the task, and moves down the ladder. Asking "Why else" or "How else" stimulates a search for other options or views at the same (or parallel) level of abstraction. Moving up and down the Ladder of Abstraction, viewing many possibilities at different levels, helps to determine the most appropriate and useful level of abstraction at which to pose and work with the task.

Morphological Matrix: The Morphological Matrix uses three to five key parts or parameters of the task as a framework for creating new options. Each parameter is listed as a column heading in the matrix. Below each parameter are placed specific examples of possible values that parameter might have. New options are generated by selecting one item from each column. These items are combined to make a composite option. A matrix containing four parameters with ten values for each parameter yields 10,000 possible combinations.

Visually Identifying Relationships (VIR): VIR uses visual images to help group members distance themselves from an issue in order to develop fresh and novel perspectives. After an initial relaxation exercise, group members look at three to four pictures and record several observations or reactions to each on a worksheet (individually and quietly). Group members then connect their observations and reactions back to the task to generate highly original or unusual possibilities. By stepping away and then reengaging, there is an increased probability of finding new perspectives on the task.

TABLE 14.2 Creative problem-solving tools for focusing options

Advantages, Limitations, Unique, Overcoming Limitations (ALUo): ALUo provides a structured approach to analyzing and developing promising options. To use this tool, identify the Advantages (strengths), Limitations (concerns or possible weaknesses), and Unique Qualities (novel or useful elements) of an option. In addition, you will develop and strengthen the option by identifying and overcoming the key limitations (overcome limitations). The tool's structure helps avoid the common idea slaughtering that often occurs when groups confront novel or unusual options.
Criteria: Criteria are used to make the process of evaluation and decision-making explicit and deliberate. First, develop a list of possible criteria using the generating guidelines. Then, use the focusing guidelines to select the key criteria to act as "yardsticks" for evaluation. These yardsticks are used to screen, select, and support options under consideration. When creating the list of criteria, use the phrase, "Will it…." Once the criteria are chosen, they may be applied informally or in conjunction with other structured focusing tools (e.g., Evaluation Matrix).
Evaluation Matrix: The Evaluation Matrix provides a structure for evaluating promising options against key Criteria. Write specific Criteria across the top and options to be evaluated down the left side of the matrix. Complete the matrix by evaluating each option against the Criteria, column by column. A rating scale is used to determine how well each option meets each specific criterion. The results of the matrix are then used to evaluate, develop, and strengthen the options.
Selecting Hits: By Selecting Hits, an individual uses internal or implicit criteria, experience, and personal judgment to identify and select promising options from a list of alternatives. Review the options and ask, "Which ones are on target, intriguing, or intuitively seem to be the best possibilities?" Selecting Hits is often used as an initial or preliminary focusing tool, particularly when considering a large number of options.
Highlighting: Highlighting is a tool commonly used to compress options. First, options considered important, called Hits, are selected from a list. The Hits are then clustered into groupings called "hot-spots," based on emerging themes. The theme for each Hot Spot is identified and used as a title for the grouping. Finally, the titles for each Hot Spot are restated in a format that accurately captures the meaning of the hot-spot.
Paired Comparison Analysis (PCA): The PCA uses a simple grid to develop an understanding of the relative priority of a group of options. Individuals list the options under consideration on the PCA form. Options are then compared to each other, one pair at a time. Two decisions are made for each comparison: First, which option is most important? Next, how much more important is one option over the other? A rating is then assigned. Total scores are calculated for each option and used to understand their priority. Individual results can be placed on a flipchart and used to help groups come to consensus about priority.
Musts/Wants: Sorting options into "Musts" and "Wants" provides an informal but effective approach to focusing options. A person selects, evaluates, and places promising options into categories of priority called Musts and Wants. Musts are the most important options that most certainly need to be addressed in order to reach a sound or effective choice or decision. Failing to consider the Musts may jeopardize the success of subsequent efforts or actions. Wants are options that you would like to consider for selecting, refining, polishing, or strengthening, although they may not be "critical factors" influencing the success or failure of future efforts or actions. The Musts are what you *have* to consider; the Wants are what it would be *nice* to consider.
Short-Medium-Long (SML): This tool is used to focus options by arranging them in a meaningful way based on time. Short-, medium-, and long-range time frames are defined, and then promising options are placed into groups based on these time frames.

or adaptive options (Gryskiewicz, 1987). Knowing the kind of outcome you desire (more radical or incremental) can help you to choose, organize, and sequence the use of generating tools. For focusing tools, you can make choices based on how many alternatives you have. If you have been successful in generating many, varied, and unusual options, you may suffer from cognitive overload (Elsbach & Hargadon, 2006; van Merrienboar & Sweller, 2005). For larger numbers, you may need tools that help to organize or sort options down to a more reasonable number for further consideration. For small numbers, you may need to apply tools that develop and strengthen options.

The learning dynamics at this stage are primarily cognitive, acquiring knowledge through thought and experience. The best way to introduce the tools and guidelines is through experiential learning (Smart & Csapo, 2007) based on adult learning theory (Knowles, 1984). For example, we often begin by asking participants (working in groups) to generate as many ideas as they can for a well-known object. We record the number of ideas each group generates and debrief the activity. They often identify what they did as brainstorming. We then ask them to identify the four guidelines for brainstorming. We often need to help groups correctly identify the guidelines, and then ask them to think about what may have kept them from generating even more ideas. They will often identify the fact that the facilitator was working on a flipchart, and they had to wait until he or she were finished before offering additional ideas. We then introduce them to the idea of brainstorming with Post-its to overcome this production-blocking effect. We then ask them to go back to that object and do another round of generating using Post-its and working to follow the four guidelines. The results usually show a dramatic improvement in group fluency.

When it comes to focusing tools, we follow a similar approach. We ask participants to provide comments on a relatively unknown and novel product. They generally provide negative judgments. We debrief this with the participants, and then introduce the guidelines for focusing, along with the ALUo (advantages, limitations, unique, and overcoming limitations) tool. We go back to the object and practice the application of the ALUo tool and debrief the differences in behavior from the first round of comments.

Once participants are comfortable with the two sets of guidelines and kinds of thinking, we introduce them to the other tools in the toolkit (and described in more detail within Tables 14.1 and 14.2). We apply the tools on prepared tasks so they experience how the tools actually work and the unique value each tool provides. The general learning dynamics are providing participants with a briefing about the tool, engaging them on its actual use (doing), debriefing its use (how did it work), and then developing insights for their future individual or group use of the tool.

Linking Skills and Tools to Need and Purpose

There is no shortage of creativity tools. The key is to know how to apply these tools appropriately. The first level of preparation is to know if you are at a point where generating many, varied, unique options is needed, or are you at a place where you have the options and now need to screen, select, and strengthen selected options. During CPS, these two kinds of thinking are kept distinct (Parnes, Noller, & Biondi, 1977) and referred to as maintaining a dynamic balance. This dynamic balance between judgment and imagination is reflected within each stage of CPS (Parnes & Biondi, 1975).

There are many models of the creative process and some convergence on the core processes involved (Funke, Fischer, & Holt, 2018; Kaufmann, 1988; Mumford & McIntosh, 2017; Mumford, Mobley, Reiter-Palmon, Uhlman, & Doares, 1991). The CPS framework provides one model of three basic clusters of these processes (need for clarity, ideas, or to plan for action). Linking the tools and guidelines to these components of CPS is based on the need within the task. Putting the tools to work within the right component also ensures that the appropriate language is applied.

The language we use influences our thinking and problem-solving (Sapir, 1929; Whorf in Carroll, 1956). Although the Sapir-Whorf hypothesis and the concept of linguistic relativity created some controversy in cognitive science, there is some consensus that the language we learn, speak, and write is a guide to the language in which we think and solve problems (Hunt & Agnoli, 1991; Hussein, 2012; Lakoff & Johnson, 1999; Pourcel, 2002). The integration of general semantics within the Buffalo-based approach to CPS was deliberate (Noller, 1971).

For example, brainstorming could be applied to framing a problem within the understanding of the challenge component. What you would generate would be problem statements that would start with invitational stems like "How to…" or "In what ways might we…." If you had a clear statement of the problem but needed ideas, you could use one of the problem statements to generate ideas. If you had a solution and wanted to involve others in helping to evaluate it, you could use brainstorming to generate a variety of criteria. Then you could use the invitation stem: "Will it…?"

The point is that the CPS framework is applied based on the task and need under consideration. In a sense, the framework is an open system that helps to provide the most appropriate cognitive activity and language for tasks that require creative thinking. This level of activity demands the use of metacognition (Coutinho, Wiemer-Hastings, Skowronski, & Britt, 2005).

This phase of learning involves declarative knowledge of cognition, encouraging participants to understand their problem-solving preferences, yet focusing more on the needs within the task and the people involved. Participants build on their procedural knowledge of cognition regarding the

guidelines and tools, and now move to determining the best fit to the CPS framework – and learn to apply conditional metacognition to determine when and why to apply the guidelines and tools.

Participants then move to the regulation of cognition by engaging in purposeful planning. For example, based on their understanding of the task at hand, if the need is for clear direction for future opportunities or understanding potential obstacles, constructing opportunities may be the appropriate CPS stage. If the need is to obtain an improved understanding of the key data within a task, the exploring data stage may be appropriate. If the task need is for a clear statement of the problem, framing problems may be the best fit. All three of these needs would locate the task within the understanding the challenge component. If the task contains a clearly defined problem statement that needs many, varied, and original ideas, the generating ideas component and stage would be the best fit to the CPS framework. If the need is to narrow down, evaluate, or analyze options, then the developing solutions stage would be the best location within the CPS framework. Finally, if the need is developing actions and understanding sources of assistance and resistance, then the building acceptance stage would be appropriate. These final two stages would place the focus of work within the preparing for action component.

When learning and applying CPS at this level, learners first practice their regulation of cognition by practicing the diagnosis on a series of presented tasks that clearly call for specific needs within the CPS framework. Then, they work with their own or another's real task to locate themselves within CPS. This provides them with insight into what language or invitational stems to apply to their problem-solving efforts and builds their conditional metacognitive knowledge.

Applying CPS on Real Challenges and Opportunities

Once you know which part of the CPS framework fits the need of the task, the focus turns to application and use of the process. This activity is grounded within the context surrounding the task. The planning of the process approach is the main responsibility of the CPS facilitator. The facilitator has worked with the client – the person who owns the task – to prepare the appropriate level of application, determine which part of the framework provides the best fit to the need, and decide on the tools and language to be deployed. The facilitator and client can also determine the level of involvement of other people for the session (a single group meeting), project (coordinated series of sessions), or initiative (a larger and longer-term project). These others take the role of resource-group members and use their knowledge, expertise, and perspectives in service of the client's need.

A session is the actual working meeting for a real group to interact to engage in the tools, follow the guidelines, and work to both generate and

focus options. Small group sessions usually last two to three hours. The facilitator takes the process-leadership role and manages the client's interaction with the resource group. Specifically, as a result of facilitator-client interaction, the group is provided a visible summary of the task, including key background, the desired session outcome, and a working statement that uses the appropriate language to guide the generating and focusing. The facilitator would have chosen CPS tools, briefed the group on the guidelines, and prepared the session logistics. During the session, the facilitator will check with the client to ensure the outcomes are being met and make adjustments to the tools as needed. When the session concludes, the facilitator ensures that clear next steps are identified and that the outcomes are recorded.

The learning dynamics at this level depend on social learning (Bandura, 1977), social metacognition (Chiu & Kuo, 2009), and shared mental models (De Church & Mesmer-Magnus, 2010a,b; Lim & Klein, 2006) or schemas (Georgeon & Ritter, 2012; Shea & Wulf, 2005). While applying CPS, the facilitator engages in metacognitive monitoring and evaluating to ensure that the social collaboration is working well – making adjustments along the way. As a result of the planning between the facilitator and client, a shared mental model is developed, and then the resource group is engaged within this approach. Shared mental models have generally demonstrated a positive impact on team performance (Mohammed, Ferzandi, & Hamilton, 2010; Van den Bossche, Gijselaers, Segers, Woltjer, & Kirschner, 2011).

Applying the CPS framework in this manner enables social metacognition (Levine & Smith, 2013; Salonen, Vauras, & Efklides, 2005). As CPS tools are introduced and guidelines are reinforced, the group can focus their thinking and problem-solving on the task at hand – and consciously reflect on how they are contributing. Having an explicit task and process allows for a level of transparency that can be monitored and evaluated at a collective level (Frith & Frith, 2012).

Needed Future Research

It is well beyond the scope of this chapter to review the general research on creativity. There are many recent and comprehensive resources aimed at addressing that challenge (Feist, Reiter-Palmon, & Kaufman, 2017; Glăveneanu, 2016; Plucker, 2017; Shiu, 2014; Thomas & Chan, 2013; Zhou & Hoever, 2014). Instead, this section focuses on the various needs for further research surrounding the current approach to CPS.

There is a great deal of evidence supporting the learning, application, and impact of the Buffalo-based approach to CPS (Basadur, 1993; Buyer, 1988; Puccio, Firestien, Coyle, & Masucci, 2006; Rose & Lin, 1984; Scott, Leritz, & Mumford, 2004a,b; Sousa, Monteiro, Walton, & Pissarra, 2014). We are well beyond the fundamental question: Can we deliberately develop creative talent?

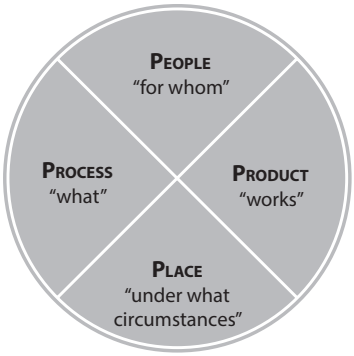

FIGURE 14.4 A model for future research on creative problem-solving.

A more challenging question is: What works, for whom, and under what circumstances (see Figure 14.4)?

Many creativity scholars have argued for a more sophisticated methodology to future CPS research by taking a systemic (Csikszentmihaly, 1999; Hennessey, 2017), ecological (Harrington, 1990; Isaksen, Puccio, & Treffinger, 1993), or interactionist (Mumford & Gustafson, 1988) approach. Woodman and Schoenfeldt (1990) promoted this more interactionist approach by asserting that it would allow appropriate levels of complexity to better understand creative behavior. This research framework, although focused on CPS, is an attempt to take a systems approach for future research.

What works?

The current thrust of most impact studies already links method (process) to product (results). Much of this research focuses on the impact (often effect sizes) of various training methods. This is certainly a good place to start. Future research could make even more targeted comparisons among alternative methods for various kinds of impact in specific domains. For example, studies could compare the current approach to CPS versus design thinking for efficacy in new product development in a specific targeted industry. This comparative research could be conducted at a specific tool level, rather than on a process or framework level. This sort of research would be invaluable to practitioners trying to unleash creative talent.

Comparing Various Process Frameworks

Since there are many models of the creative process, future research should be conducted to determine their efficacy by comparing outcomes derived by various models. Despite wide usage of CPS methods within organizations, there is a paucity of comparative research regarding methods and models of

CPS (Stein, 1975). The majority of research supporting the effects of deliberate training and learning of CPS methods usually examines those trained in a method versus a control group (i.e., Basadur, Graen, & Green, 1982). Only two notable exceptions were found. Ekvall (1981) conducted an experiment to compare four different methods (brainstorming, analogical problem-solving via Synectics [Gordon, 1961], morphological analysis [Zwicky, 1969], and the discussion method) within the product development context. He found mixed results on novelty, originality, and usefulness on real-world solutions generated by these methods. Ekvall and Parnes (1984) followed up on Ekvall's first study using real-life criteria to compare four methods, including brainstorming, brainstorming combined with analogical thinking, morphological analysis, and leaderless discussion (Maier, 1963). They found that brainstorming combined with Synectics-like analogical thinking produced the highest-quality solutions.

Given the proliferation of models and methods for CPS, we would be well-served to conduct and design comparative studies using a clear vocabulary. For example, brainstorming is a tool or technique. Synectics, CPS, and design thinking are methods. Future research should be conducted using fair comparisons: tool against tool, full method against full method.

Assessing Impact of Diverse Training Designs

Impact research needs to go well beyond single-shot courses and examine various durations of training, content, and delivery systems (Mumford, 2003). What is the optimum amount and kind of training required to produce novel, useful, and elegant outcomes? Again, there is a paucity of research that addresses these issues. An example of this type of research is proved by Parnes (1966b). He examined training in CPS by comparing programmed instruction versus programmed instruction with direct teacher-led instruction. Three randomly selected groups, matched on IQ, were assigned to the two experimental conditions along with a control group. On the basis of numerous creative ability assessments, the results from the instructor-led group were consistently superior to the control group and the group that used only programmed instruction.

Similar kinds of studies should be conducted comparing more current delivery technologies, differing training designs and durations. This line of research should follow the three main guidelines suggested by Valgeirsdottir and Onarheim (2017). These include assessing creativity both pre- and post-training, using control groups, and ensuring a sufficient sample size. These studies would provide insights to guide training and development design within organizations.

Strengthening Impact Criteria

How we determine the increase in value derived from learning and applying CPS needs some attention. Much of this work is descriptive, uses samples of

convenience, or focuses on increases in cognitive ability or potential. Many studies use measures of divergent thinking to assess the impact of creativity training (Runco & Acar, 2012). Runco (2008) argued for going beyond divergent thinking and differentiating among creative potential, creative products, creative performance, and creative problem-solving. Future research must focus more on real-life criteria that are more relevant to organizational applications (see Montag, Maertz, & Baer, 2012).

For Whom?

If the goal is unleashing creative talent, then we need a good understanding of talent – particularly the talents required to solve creative problems. A preponderance of creativity research has been aimed at understanding the characteristics associated with high-level creativity in people (Kaufman, Pumaccahua, & Holt, 2013; MacKinnon, 1978). Making a distinction between level (capacity, ability, degree) and style (preference, predilection) of creativity is a more recent trend within creativity research (Isaksen, 2004; Kirton, 2003). Separating the question, "How creative are you?" from "How are you creative?" offers insights into individual differences when learning and applying CPS. It is likely that everyone brings something different to the creative process and may benefit differently from the creative process (Treffinger, Selby, & Isaksen, 2008). In fact, emerging research is beginning to provide some specific ways style of creativity interacts with CPS (Basadur, Gelade, & Basadur, 2014; Isaksen & Geuens, 2007; Puccio, Wheeler, & Cassandro, 2004).

This research is focused on linking personal style with the CPS process. Further research needs to focus on linking these insights with outcomes. Wang and Horng (2002) provided an example of this approach. They examined the impact of CPS training on R&D productivity and considered style as well. They found an increase in fluency and originality skills, improvement in R&D performance, and implications for creativity style. Namely, they found stronger effects for those with extroverted and feeling cognitive-type orientation. Another example was provided by Sitar, Cerne, Aleksic, and Mihelic (2016). They found that independent and collaborative learning styles were associated with higher levels of creativity, yet the relationships were mediated by other individual difference variables like self-efficacy and enjoyment of learning.

Determining Key Individual Differences

Style differences could be more salient in different stages or phases of CPS. Future research could examine more deeply how individual differences play out along the full creative process. Aptitude-treatment-interaction (ATI) is a research approach that examines how the quality of outcomes depends on the

fit between peoples' aptitudes and the treatments they receive (Cronbach, 1967; Cronbach & Snow, 1977; Snow, 1991). Puccio, Wheeler, and Cassandro (2004) provided a typical example of a CPS impact study. They examined whether participants' styles interacted with their reactions to training on CPS. Problem-solving style was the aptitude; the treatment was 40 hours of instruction on CPS. They found significant interaction; however, they did not make any comparison regarding an alternative delivery system or approach, did not examine impact through a pre- or posttest, and did not include a control group. Future impact research should follow these suggestions outlined by Valgeirsdottir and Onarheim (2017) and take advantage of the ATI approach to further our understanding of what works for whom.

Although much current research focuses on problem-solving style as a key individual difference variable, other constructs should be included in this approach. For example, the level and kind of expertise and domain relevant knowledge required for successful application of CPS could contribute to the ongoing debate regarding the general versus content-specific issue.

Determining Effects of Social Roles

The emergence of the roles of client(s), facilitators, and resource-group members in CPS offers new ground to be addressed by future research. What are the effects of differentiating these roles? The notion of ownership for change and the role of sponsor are well established in the literature on organizational change and innovation (Amezcua, Grimes, Bradley, & Wiklund, 2013; By, 2005; Goodman, 1983; Kelly & Amburgey, 1991). Applying CPS also requires ownership for the task under consideration. Otherwise, the outcomes have minimal or no likelihood of implementation. The social role of client can be held by a single individual or by multiple individuals. Questions to be addressed through future research include the following: What are the desired characteristics of clients? Does shared clientship influence the impact of CPS? How much expertise in the task domain is required from the client for successful application of CPS?

Those who join a group application of CPS to offer their perspectives and input on the task are referred to as resource-group members. How much diversity of expertise, both content and process, is required for what types of tasks? How does both process and content diversity affect the outcomes and impact of CPS? This line of inquiry would require attention to the group performance (Dayaram & Fung, 2012) and team cognition (De Church & Mesmer-Magnus, 2010a,b) literature.

The process-oriented leadership role of the facilitator plays an important part in managing group CPS. Although there is abundant practical literature on the topic, there is scant empirical research to guide practice (Gregory & Romm, 2001). An exception can be found in the field of group support systems

(GSSs). Bostrom, Anson, and Clawson (1993) provided an extensive review of group facilitation within a GSS. This was followed by numerous studies of the effect of this role in GSS groups. For example, Anson, Bostrom, and Wynne (1995) examined the impact of facilitation on the performance of 48 GSS groups and found that facilitated groups experienced improved group processes and greater cohesion. They also found that the quality of facilitation moderated the impact on the quality of group outcomes. These results were confirmed by Miranda and Bostrom (1999).

The literature then turned to examination of the desired competencies of facilitators (McFadzean, 2002; Nelson & McFadzean, 1998). For example, Wardale (2013) interviewed managers across five industry sectors regarding their best and worst facilitation experiences in order to identify stages and strategies of effective group facilitation. She found four stages of group facilitation, including preparation, the event, satisfactory outcomes, and transfer. She also found clear strategies and tactics for the first three phases, but the participants identified frustration when the results and outcomes of group work were not implemented. The participants lacked well-developed facilitative processes or systems for maximizing the implementation or transfer of their results to the workplace. This suggests that future research should be aimed at improving our understanding of specific facilitator skills and abilities to encourage impact of creative results. Baer (2012a,b) provided an example of this kind of research. He found that implementation of creative ideas can be enhanced when participants are highly motivated to realize their ideas and when they are also highly skilled networkers.

Understanding and Appreciating Style

There is preliminary experimental evidence that providing feedback to participants engaged in CPS regarding their preferred problem-solving styles enhanced problem-solving performance (Main, Delcourt, & Treffinger, 2017). These findings seem to support the value of providing participants declarative knowledge of cognition – metacognitive knowledge about oneself as a problem solver. Much more research needs to be done to confirm and extend these findings. Further, the Main et al. (2017) study included students engaged in the Future Problem-Solving program. We need to conduct future experimental research with adults and professionals on real challenges within organizations.

Under What Circumstances?

Unleashing creative talent does not happen in a vacuum – it occurs in a specific context (Shalley & Gilson, 2004). It is quite probable that people can learn the very best CPS skills and tools but work in a context that would not provide them

the opportunity to apply this learning. Progress has been made in understanding the context, climate, and culture that support creativity (Amabile, Conti, Coon, Lazenby, & Herron, 1996; Ekvall, 1996; Hunter, Bedell, & Mumford, 2007) and how leadership plays a key role in creating this climate (Isaksen, 2017).

Understanding the people-place-process interactions would enhance our ability to establish appropriate conditions for learning and applying CPS and for deeper impact within organizations. Future research along these lines could be done along multiple levels (work-unit, divisions, functions, industries, and national cultures) of analysis. Robinson-Morral, Reiter-Palmon, and Kaufman (2013) provided an example study that explored the linkages among people (self-efficacy), place (requirements for creativity in the workplace), and CPS. Their findings suggested that quality and originality of CPS solutions were highest when people have requirements for creativity at work, as well as the belief that they are creative.

Creating Conditions to Sustain Learning

What factors or dimensions within a team or organization are most important for sustained creative behavior in specific contexts and domains? We need to go well beyond the single facilitated CPS session that produces novel and useful outcomes to focus more on the stimulants and obstacles to the implementation and diffusion of the outcomes. Baer (2012a,b) pointed out some of the attributes of the participants, but we need to go further into how to prepare them to take their ideas forward and continue their learning. This future research should be informed by the expansive organizational innovation literature (e.g., Isaksen & Tidd, 2006; Tidd & Bessant, 2009). Moving from an "event" orientation to a "journey" orientation may help create conditions that support learning from success and failure. Future research could inform us about the most productive balance in disseminating previous learning from both positive and negative CPS experiences.

Determining Dimensions of Organizational Climate

Understanding the work environment is key to establishing the circumstances that support the learning and application of CPS within organizations (Oldham & Baer, 2012; West & Sacramento, 2012). Hunter, Bedell, and Mumford (2005) provided a review of the literature and identified 14 dimensions of a creative climate. Hunter, Bedell, and Mumford (2007) conducted a meta-analysis and concluded that climate was strongly related to creative achievement across contexts and criteria. However, we lack consensus on which dimensions of the climate for creativity are most salient for both learning and applying CPS. The climate or work environment for creativity can have differing levels

of influence on type of outcome (exploratory or exploitative). Further, you may have the best-trained facilitators and CPS tools, but if the climate does not support their effective use, little productivity or transfer will result. Future research must help us determine which dimensions are more important for different kinds of tasks, people, and stages of CPS.

Linking People and Place

We sometimes artificially separate aspects of people (style, competence, personality) from place (climate, context). We need to better understand the integration of people and place – as this interaction is key to both learning and creativity. There is support in the literature for the importance of linking style as a people-oriented construct and climate as a work-environment construct (Armstrong, Cools, & Sadler-Smith, 2011; Kozhevnikov, Evans, & Kosslyn, 2014). Within the creativity literature, studies have shown that the effect of leadership behaviors on organizational creative performance is moderated by climate (Ekvall & Ryhammer, 1999; Isaksen & Akkermans, 2011; Jung, Chow, & Wu, 2003; Jung, Wu, & Chow, 2008). Are certain climates or contexts likely to interact with individual style preferences and then impact CPS performance? Isaksen and Aerts (2011) found that problem-solving style did influence perceptions of best and worst-case climate for creativity. Are there other individual difference variables (i.e., level of expertise, gender, etc.) that should be considered to better understand the linkages between people and place? The linkages between people and place could be explored further via the individual, group or team, and organization, as these are central to linking learning and creativity.

Conclusion

Learning and creativity are linked through the process of discovering and defining problems and opportunities, generating ideas, and putting those ideas to work. CPS is a natural outgrowth of the intersection of learning and creativity. The Buffalo-based approach to CPS provides a comprehensive system that has been subjected to more than 60 years of continuous research, development, and application. As such, it offers potential to help organizations, teams, and individuals to nurture and release their creative talent. Much more research and development remain to be done in order to focus on its productive organizational use.

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