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The Relationship Between Expressed Creative Problem-Solving Preference and Divergent Thinking Attitudes

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Abstract
The purpose of this study was to examine the relationship between an individual's expressed creative problem style and divergent thinking attitudes. The problem-solving preferences were measured by the FourSight Breakthrough Thinking Profile and identified four preferences, Clarifier, Ideator, Developer, and Implementer. Divergent thinking attitudes, preference for ideation, and premature evaluation were measured by the 14 Item Ideation-Evaluation Preference Scale. The multidisciplinary sample was drawn from non-profit, business, education and higher education, specifically a Masters of Business Administration program. Significant relationships were found between the participants (N = 374) who identified with high Ideator and Implementer scores and preference for ideation. Significant relationships were also found with those who identified with high Ideator scores and the preference for evaluation. Those who identified as Ideators were the only preference that presented significant relationships to both divergent thinking attitudes. The results suggest implications for work in creative problem solving and innovation. If the two divergent thinking attitudes are a foundation to seeking creative solutions, not having individuals who identify as Ideators in the workplace or on a team can potentially hinder creative outcomes. Identifying individuals with preferences capable of divergent thinking or a tendency to not prematurely evaluate can support increased original insights and options. Recommendations for consideration and further research are discussed.

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The Relationship Between Expressed Creative Problem-Solving Preference and Divergent Thinking Attitudes

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Dedication

As I come to the end of this personal and professional journey, I have so many thank yous to give to all the people who made this uphill climb possible. I am thankful to the faculty and staff at St. John Fisher College for the encouragement and individualized attention throughout this process. Thank you to my Dissertation Chair, Dr. Jason Berman, who often put work aside to meet and discuss where I was in my quest to complete the dissertation process, always taking time to get me back on track. Thank you to Dr. Jeanette Silvers, for early morning calls, coffee chats, additional meetings, and kind words of support in this process. You both told me early on, you were like running coaches preparing the runner for a marathon, and you were going to get me to the end. Here we are; and the finish line is in sight! A special thanks to Dr. Stephanie Townsend, for your amazing instructional methods. Your facilitation and approach are a unique skill set; and I extend heartfelt thanks for your availability and support.

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my life, one who has often found creative solutions and taught me to be a creative problem solver.

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Lastly, I want to thank my grandfather, Austin L. Stephany, who is no longer with us on this earth, but he is in spirit. I offer this work to you. You always listened to me, took interest in all my work, and have been a source of encouragement in my life. I love you and miss you every day! Thank you for watching over me on this incredible journey.

Biographical Sketch

Jona A. Wright has been a teacher, principal, and district administrator in the New York State K-12 systems, both public and private. She has also worked in professional and human capital development in the private sector, where her interest in leadership and innovation was further sparked. She holds a Bachelor of Science degree in Speech Language Therapy from the State University of New York (SUNY) at Geneseo. She also holds a Master of Science degree in Literacy Instruction, K-12, from SUNY Geneseo, and a Master of Science in Educational Administration from St. John Fisher College. She began her doctoral work in Executive Leadership at St. John Fisher College in the summer of 2015. Mrs. Wright pursued her research in creative problem solving under the direction of Dr. Jason Berman and Dr. Jeanette Silvers and received the Ed.D. degree August 2017.

Abstract

The purpose of this study was to examine the relationship between an individual's expressed creative problem style and divergent thinking attitudes. The problem-solving preferences were measured by the FourSight Breakthrough Thinking Profile and identified four preferences, Clarifier, Ideator, Developer, and Implementer. Divergent thinking attitudes, preference for ideation, and premature evaluation were measured by the 14 Item Ideation-Evaluation Preference Scale. The multidisciplinary sample was drawn from non-profit, business, education and higher education, specifically a Masters of Business Administration program.

Significant relationships were found between the participants ($N = 374$) who identified with high Ideator and Implementer scores and preference for ideation. Significant relationships were also found with those who identified with high Ideator scores and the preference for evaluation. Those who identified as Ideators were the only preference that presented significant relationships to both divergent thinking attitudes. The results suggest implications for work in creative problem solving and innovation. If the two divergent thinking attitudes are a foundation to seeking creative solutions, not having individuals who identify as Ideators in the workplace or on a team can potentially hinder creative outcomes. Identifying individuals with preferences capable of divergent thinking or a tendency to not prematurely evaluate can support increased original insights and options. Recommendations for consideration and further research are discussed.

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Chapter 1: Introduction

Wayne Weaver was not going to be surpassed again for hosting one of the highlighted sports events of the year, which would generate upwards of $300 million by visitors to the city. He used out-of-the box thinking, or creative problem solving, to find a solution for the city of Jacksonville, home of the Jaguars, to be able to hold the 2005 Super Bowl XXXIX. The challenge for Jacksonville was a need for hotels, entertainment space, and dining. Weaver, not closed to new ideas, turned to a similar solution that Barcelona used for the '92 Olympics. Calling in cruise ships, or floating hotels, to line the waterfront city would accommodate thousands for the premier sporting event of the year. On November 1, 2000, the Commissioner of the NFL named Jacksonville the host of Super Bowl XXXIX (Oehser, 2014). Because of Weaver's ability to see the possibilities and look for new and novel ideas, he won the position to host one of the largest sporting events of the year.

Like Weaver, what do Maurice Lim Miller, Dennis Littky, and Elliott Washor have in common? Miller is the founder of Family Independence Initiative, an anti-poverty group, who has fought the war on poverty and won in many ways in the Oakland and San Francisco areas. He has seen the income of families, who joined his groups, increase 27%; and the ability for them to buy a house and start a business became a reality (Headlee, 2012). Littky and Washor believed that when students in some of the roughest- and toughest-to-teach populations in Detroit and Los Angeles, among others, were given their choice of learning, they could achieve. Their aspirations came true with

the birth of Big Picture Learning (2008); and the organization has seen success rates of students in places, like Oakland, reach 95.5% from 25% in the local school district (Big Picture Learning, 2008). The common thread that runs through each of these situations is the ability, unlike others, to see what is possible, to be creative, and to find the new and novel solutions that impact the situation (Amabile, 1983).

To contrast, Eastman Kodak Company (Kodak) was an American icon of industrial invention (Usborne, 2012). Kodak was led by the creativity and innovation of George Eastman and many who followed. The company experienced "golden years" of prosperity before starting to decline, which was due, in part, to the lack of executive foresight to see its future in digital device development. A chain of events, such as not seeing the value of possibly producing the world's first digital camera, turning down the opportunity to be a competitor to sponsor the 1984 Olympics, or not funding a digital camera for fear of losing the film business are illustrations of possibly not seeing value in broadening a company's decision making and using divergent thinking.

Tales of misfortune created by the lack of allowing creativity to flow can be seen across cities flagged with poverty, giving rise to evictions linked to poverty as described by sociologist, Matthew Desmond (Schuessler, 2016). Education systems are not immune to the lack of creativity their attempts to increase graduation rates and decrease dropout rates. While the world outside school walls has changed drastically, some school systems resemble the schoolhouses of days past. Yet, there is still a struggle to invent and create programs to meet not only the demands in schools, but of the world, which is knocking on a graduate's door.

If engagement is defined as involvement in and enthusiasm for school, challenges remain (Gallup, 2016). Student engagement diminishes from elementary school, where engagement levels are relatively high, at 80%; to middle school, at 60%; and in the 2015 Gallup Student Poll (Gallup, 2016) of over 860,000 students, only 40% of high school students felt engaged. Will Richardson (2016) inquired about the *best guess* curriculum used in schools aligning to the self-directed workplace that students will enter. Wagner and Dintersmith (2015) challenged our current educational state by asking if we are preparing our students for a society where there will be no jobs, leaving the graduation rates to seem like an easy puzzle to solve. Is there something that differentiates individuals who can see beyond the current state to find new solutions to occurring problems?

A number of scholars address the qualities of individuals and leaders that can move organizations, industries, and school systems, and there seems to be some conceptual overlap. These individuals share a trait or a principle that Kouzes and Posner (2012) would call *challenging the process*, or *not settling for the status quo*. These individuals used new and creative ideas to change the current state. They were not afraid of taking risks and experimenting or interpreting failure as opportunity, along the way (Kouzes & Posner, 2012). Sternberg and Lubart (1995) shared a similar viewpoint of creative individuals, and they share four characteristics:

1. determination in the face of challenges and continued belief in self;
2. willingness to try something new and take risks;
3. openness to experiences and trying new ways; and
4. tolerance for ill-defined and ambiguous situations.

These characteristics resemble some of the descriptors used to categorize individual, creative problem-solving styles in the FourSight: Your Thinking Profile, which is a "leading assessment tool, designed to boost critical and creative problem-solving skills in individuals and groups" (FourSight, n.d., para. 5). For example, within the FourSight thinking, an Ideator is described as a person who looks at the big picture, enjoys playing with new ideas, and thinks globally, while using his or her imagination (Puccio, 2002). Basadur and Finkbeiner (1985) suggested an added dimension of divergent thinking, or generating multiple ideas while deferring judgment, can support and improve creativity and creative problem solving.

There seems to be a continued focus on creativity and innovation, as drivers of prosperity. In a recent study of creative capitalism and the Global Creative Index (GCI), Florida, Mellander, and King (2015) revealed a continued focus on creativity, highlighting its importance for economic progress, social progress, and innovation. The GCI is a:

> broad-based measure for advanced economic growth and sustainable prosperity based on the 3Ts of economic development—talent, technology, and tolerance. It rates and ranks 139 nations worldwide on each of these dimensions and on our [Martin Prosperity Institute] overall measure of creativity and prosperity. (para. 1)

The GCI is an indicator for nations, where it is high, for not only economic output and competitiveness, but human development. Florida et al. (2015) highlight the 3Ts, including talent and tolerance. These variables are enablers of creativity. The GCI is another illustration of creativity, with contributors not only as individuals and teams, but building the successful outcomes as a nation. Tim Brown, of IDEO, which is a global

design company, posted on LinkedIn that organizations cannot compete without creativity and creativity-adept employees. He went on to explain that this does not mean hiring a volume of designers, yet it requires a mindset change (Brown, 2016). This change can begin with the knowledge of the creativity of the human capital in an organization. Organizations want to focus on creativity and creative solutions, and it can begin with the individuals already within the organization.

Daily, people and teams face problems and challenges in the workplace, at home, and in interpersonal relationships. How an individual or team approaches and resolves an issue can be analyzed through many lenses to view efficiencies, relationships within the situation, and the level of creativity of a new and novel solution that works within a situation. Any organization's ability to be innovative or creative is in direct relationship to the creative potential of its employees (Ray & Romano, 2013). Therefore, creative capital is constructed by the contributions of the creative individuals within an organization. When an individual takes part in creative problem solving, he or she exhibits an individual creative problem-solving style or preference (Basadur, 2004; Isaksen, Dorval, & Treffinger, 2011; Puccio, 2002). Identifying an individual's creative problem-solving preference, in combination with divergent thinking attitudes, can promote what the individual can bring to the creative problem-solving process or to make contributions that can enhance a team or organization (Puccio, 2002). This identification can, potentially, uncover gaps that could, left unattended, be detrimental to an organization's creative problem-solving focus.

Problem Statement

Technology advances, globalization, and environmental threats are causing a greater focus on creative problem solving. In a demanding global economy, the pace of change is increasing exponentially, and what existed today might be obsolete tomorrow. The World Economic Forum released a list of the top 10 skills needed in 2015, compared to what will be needed in 2020 (Gray, 2016). Complex problem solving tops the list for 2015 and 2020. Critical thinking, creativity, and emotional intelligence are the next three attributes needed in the workplace for 2020 (Gray, 2016). In America, 47% of jobs may experience a digital disruption over the next 5 to 10 years (World Economic Forum, 2016). As a result of these outside forces, there is a focus across disciplines on creativity and creative problem solving, cited by employers and CEOs as the top needed skills in the workplace (Hart Research Associates, 2013; IBM, 2010).

Change is inevitable, and it will not wait for any discipline to catch up. Industries need to be proactive in identifying these skills in individuals and teams and fill in the existing gaps. This is not the time to be closed to new thinking or innovation. Creative problem solving is the precursor to innovation. Creativity can exist without innovation, but innovation cannot exist without creativity (Okpara, 2007). Innovative organizations do not just *outdo* the competition, they *out think* others (Bonchek & Steele, 2015). Google, Pixar, and IDEO are companies that consider not only what individuals do but how they think.

A comprehensive review of the literature supports a greater understanding of the relationship between attitudes that support creative thinking and behaviors, or preferences, in the creative process. Furthermore, research studying creative problem-

solving styles or preferences and divergent thinking attitudes is narrow. There have been minimal comparisons found using attitudinal surveys and individual creative problem styles. If creative problem solving is not understood at an individual level, how do organizations know what to seek from their personnel? If individuals, teams, and organizations knew an individual's creative problem-solving preferences and divergent thinking attitude and how these variables work together, this information could increase efficiency. Having and sharing this knowledge could facilitate communication, collaboration, and increase overall efficiency by informing what energizes and frustrates individuals who compose teams (Bonchek & Steele, 2015). Research examining the relationship between an individual's creative problem-solving preferences and divergent thinking attitudes supports an organization's efforts to increase complex and creative problem solving to create a competitive edge.

If organizations could identify individuals' thinking styles, teams could be built for better creative problem solving around these styles or creative problem-solving preferences. This could produce increased results for individuals and teams, promoting efficiency, collaboration, and communication (Bonchek, 2016). Further, the abilities to ideate and avoid premature critical evaluation are the two divergent thinking attitudes foundational to creative problem solving (Basadur & Finkbeiner, 1985). These attitudes, coupled with understanding one's preference or style within the creative process, could allow for a better understanding of teams and help organizations compose teams in an informed manner.

Therefore, this study examined the potential relationships between one or more individual thinking creative problem-solving styles and two divergent thinking attitudes

in individuals across disciplines. These findings could assist organizations in further understanding human and creative capital, as well as help to develop strategies for places where gaps exist. The findings could support improved performance and goal execution across various disciplines and how individuals contribute to teams (Basadur & Head, 2001; Ray & Romano, 2013).

Theoretical Rationale

Problems can be looked at through the lens of creativity. The study of creativity is multifaceted and lacks an agreed-upon definition (Rhodes, 1961). Defining and studying creativity can be addressed by the Four Ps (Figure 1.1): product, process, person, and press or the environment (Basadur & Hausdorf, 1996; Rhodes, 1961). Most research focuses on one of the four areas of creativity. These areas are person, product, process, or press. Creativity, when studied from the process perspective, often refers to the process that individuals undertake to develop novel solutions to problems (Amabile, 1983). This study focused on the person and on the process of creative problem-solving preferences and divergent thinking attitudes within the process.

Defining Creative Problem Solving (CPS)

It is important to understand the background of creative problem solving. The foundation for it supports where creative problem-solving preferences and divergent thinking attitudes fit into the equation of this growing field. There is a meaningful distinction between problem solving and creative problem solving. Creative problem solving is a systematic framework that supports individuals and teams in analyzing problems, generating and refining ideas, and implementing action plans and solutions,

such solutions that can be characterized more effectively as new or novel (Amabile, 1983).

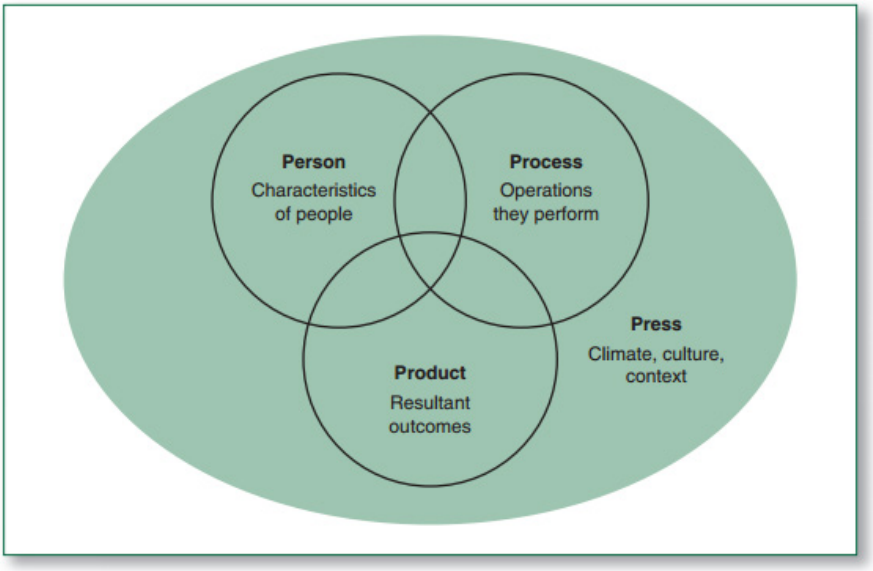

Figure 1.1. The Four Ps. Reprinted from *Creative Approaches to Problem Solving* (3rd ed.) (p. 57), by S. G. Isaksen, K. Dorval, & D. J. Treffinger. Thousand Oaks, CA: Sage Publications. Copyright 2010 by Creative Problem Solving Group. Reprinted with permission.

> Noller (1979) defined CPS by three 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).

Individuals or groups that face challenges, positive or negative, enter different phases of CPS. These include clarifying the problem, ideating about potential solutions, developing a workable solution, and implementing the solution(s) (Puccio, Mance, & Murdock, 2011). Many models for CPS are circular in nature, as individuals and teams return to various steps in the recursive process (Basadur & Basadur, 2011; Basadur & Finkbeiner, 1985; Puccio, 2002; Puccio et al., 2011; Treffinger, Selby, & Isaksen, 2008). The CPS process enables individuals and teams to tap into more of their creative potential (Puccio, 2002). It is one of the most widely used and effective creative thinking models in the world (Parnes, 1987; Torrance, 1972; Torrance & Presbury, 1984; Treffinger & Isaksen, 2005).

A fundamental aspect of the CPS theory is the divergent and convergent heartbeat of the CPS process found in each of the defined stages (Isaksen et al., 2011). This heartbeat enables the search for novel and useful insights throughout every stage. Within the stages of CPS, individuals and teams undergo a process of divergent and convergent thinking to allow for maximizing creative thoughts (Basadur, 1995; Basadur & Finkbeiner, 1985; Basadur & Hausdorf, 1996; Basadur, Runco, & Vega, 2000). Divergence and convergence are defined as foundational modes of thinking for creativity (Basadur et al., 2000). These attitudes can be measured. Looking at one's creative problem-solving preference, combined with the attitudes needed for successful divergent thinking, may maximize creative performance and support growth in areas underrepresented by an individual.

History of CPS and Key Contributors

The study of creativity and creative problem solving has had a rich history of more than 50 years of research, resulting in the development of at least 10 known models of CPS (Puccio, Murdock, & Mance, 2005). Extant research in the area of CPS extends to individuals (Basadur, 1995; Basadur & Basadur, 2011; Basadur & Hausdorf, 1996; Puccio & Chimento, 2001; Treffinger, Selby, & Isaksen, 2008), groups (Baer, Oldham, Jacobsohn, & Hollingshead, 2008; Bahr et al., 2006; Basadsur & Head, 2001; Basadur et al., 2000; Benedek & Neubauer, 2013; deVilliers, Scheepers, & Maree, 2015), and entire organizations (Amabile, Barsade, Mueller, & Straw, 2005; Basadur, Taggar, & Pringle, 1999; Wang & Horng, 2002). This research has focused on the environment (Amabile, Schatzel, Moneta, & Kramer, 2004; Basadur, 1997; Basadur, Gelade, & Basadur, 2013), styles (Weschler, Vendramini, & Oakland, 2012), and personality traits (Puccio & Grivas, 2009) related to CPS. Creativity was introduced to the scientific world by J. P. Guilford at his presidential address to the American Psychological Association, where he stated that "psychologists have seriously neglected the study of creative aspects of personality" (Guilford, 1950, p. 454).

Wallas (1926) developed one of the first models of creativity. He introduced creative thinking as a process that included the stages of preparation, incubation, illumination, and verification. Drawing from Wallas's model, Osborn (1953) conceptualized the role of creativity in the problem-solving process as the CPS process. It consisted of the following seven steps to help individuals define the correct problem and find the most creative solution: (a) orientation, (b) preparation, (c) analysis, (d) hypothesis, (e) incubation, (f) synthesis, and (i) verification (Osborn, 1953). Through

use and modification, Osborn (1957) then simplified CPS to a three-step process: (a) fact finding, (b) idea finding, and (c) solution finding. Osborn popularized CPS and introduced the term *brainstorming*. Today this is one of the most widely used terms associated with creativity (Treffinger & Isaksen, 2005). Each model that has evolved has foundations in Osborn's (1953, 1957) original models and considers the critical steps and layers of the creative problem-solving process.

Sidney Parnes (1967) introduced the Osborn-Parnes 5-Stage CPS Model consisting of (a) fact finding, (b) problem finding, (c) idea finding, (d) solution finding, and (e) acceptance finding (Parnes, Noller, & Biondi, 1977). Isaksen and Treffinger (1985) introduced mess finding and data finding to support users in ambiguity and convergence. They focused on the dynamics of the process and stressed the generation of as many ideas as possible, as well as the evaluation of the ideas also referred to as divergence and convergence (Isaksen & Treffinger, 1985). Divergent and convergent thinking are critical thinking processes woven into each of the stages of the CPS process (Puccio et al., 2005).

Isaksen, Treffinger, and Dorval (1994) further revised the CPS process by narrowing its description into three components: (a) understanding the problem, (b) generating ideas, and (c) planning for action. CPS has continued to be adapted and modified as researchers have tested models of the process. Parameters for divergence and convergence have been added as researchers have investigated attitudes that affect CPS (Basadur, 1995; Basadur & Basadur, 2011; Basadur & Hausdorf, 1996). Guidelines support more disciplined thinking within these two modes, helping new and useful insights to emerge. Basadur and Finkbeiner (1985) developed a 14-item scale that

measures two attitudes which support divergent thinking. Many conceptually similar models have been formulated for CPS including the Simplex model (Basadur, Graen, & Green, 1982), and the creative problem solving: thinking skills model (Puccio et al., 2005).

It is useful to define a few closely related and overlapping terms to better understand creative problem-solving preferences, the foundational theories of each, and divergent thinking. A brief overview of (a) creativity, (b) problem solving, and (c) the creative problem-solving process are explained to set the context for the more specific areas of creative problem-solving preference and divergent thinking.

Creativity. Creativity is a multidimensional phenomenon with no one agreed-upon definition (Basadur, 1995). Defining and studying creativity can be addressed by considering the product, process, person, and press (environment), otherwise known as the Four Ps (Basadur & Hausdorf, 1996; Rhodes, 1961). Creativity, when studied from the process perspective, often refers to the progression that individuals undertake to develop new and novel solutions to problems (Amabile, 1983). The ability to solve problems worth solving with original and useful solutions is a definition of creativity that incorporates elements of the person, process, product, and press (Amabile, 1983; Isaksen et al., 2011).

Problem solving and creative problem solving. Daily, individuals engage in solving problems that may be clear, poorly defined, have ready-made solutions, or require original solutions (Isaksen et al., 2011). There is a distinction between problem solving and creative problem solving. Problem solving, in general, may include solving problems that are well-defined, have a known path to a solution, and may also desire

readily available or proven solutions (Puccio et al., 2011). Creative problem solving requires imagination to bring clarity to an ill-defined challenge or the design of novel or original solutions (Isaksen, Dorval & Treffinger, 2000; Puccio et al., 2005).

Creative problem-solving process (CPS). Individuals and teams knowingly or unknowingly engage in creative problem solving on a regular basis (Isaksen et al., 2011). Beginning in the 1950s, Alex Osborn and Sidney Parnes began shifting creative problem solving and the active cognitive and behavioral operations from an implicit and undefined process or processes, to a defined explicit process for producing creative solutions to unstructured problems (Osborn, 1953; Parnes, 1987; Puccio et al., 2005). Foundationally known as the Osborn-Parnes creative problem-solving process (1967), it is a specific theory and model that has significantly improved individual, team, and organizational performance, and it has been researched and tested for more than 50 years (Puccio & Acar, 2015). Contemporary CPS process models, rooted in Osborn-Parnes CPS research, offer an organizing framework, coupled with thinking tools, and alternating modes of divergent and convergent thinking to produce creative insight and solutions (Basadur, 1995). Organizing frameworks support individuals and teams in (a) analyzing problems, (b) generating and refining ideas, and (c) implementing action plans and solutions (Puccio et al., 2011).

Creative problem-solving preferences. Creative studies literature has identified cognitive diversity as an important variable when individuals and teams are creative problem solving, (Basadur et al., 1990; Kirton, 1994; Puccio, 1999). Cognitive diversity is the difference in how people organize and process information as an expression of their cognitive or thinking styles and personality (Puccio et al., 2005). The review of the

literature revealed three prevalent approaches to cognitive diversity that related directly to how individuals engage in creative problem solving. Kirton's (1976, 1994) adaptor-innovator theory (AI) was one of the first theories to explore an individual's behaviors and thinking styles in relation to creative problem solving. FourSight (Puccio, 2002) and Basadur's Simplex (Basadur, Wakabayashi & Graen, 1990; Basadur, 1994) are two more recent theories that uncover an individuals' preferences in the natural steps and behaviors individuals engage in when creative problem solving. The latter two have foundations linked to the explicit stages identified in the Osborn-Parnes CPS process (Basadur, 1994; Puccio, 2002).

The terms *preferences*, *profiles*, and *styles* are used synonymously, as reflected in the literature and the tools used to define an individual's creative problem-solving preference within the CPS process (Basadur, 1994; Puccio, 2002). The profile of an individual is flexible and supports the understanding of the strengths and opportunities that individual brings to his or her own problem solving or challenges that are faced while working on a team or in an organization (Puccio, 2002). A profile does not reflect abilities or levels of success, but it can support the different ways in which one approaches the CPS process (Isaksen et al., 2011). Profiles reflect individuals at their *creative best* (Isaksen et al., 2011). Tools used to measure and/or assess profiles or preferences include Kirton's (1976, 1994) adaption-innovation inventory (KAI); the FourSight Breakthrough Thinking Tool, based on the FourSight thinking model (Puccio, 2002); and Basadur's creative problem-solving process (CPSP, Basadur et al., 1990) inventory. A brief description of the creative problem-solving preferences, tools, and important terminology follows.

Simplex theory – Basadur creative problem-solving profile inventory. The creative problem-solving process has its foundation in the Simplex creative problem-solving process theory (Basadur, 1982). The first dimension reflects how people gain knowledge by experiencing or thinking. The second dimension represents how people use knowledge to create ideas (ideation) or to judge ideas (evaluation) (Basadur et al, 1990). The two dimensions are illustrated by a quadrant with two intersecting dimensions that form four quadrants. Basadur (1994) described individuals as: (a) Generators – individuals who pull knowledge from experiencing and have high scores in ideating; (b) Conceptualizers – individuals who prefer thinking and have high scores in ideation; (c) Optimizers – individuals who have high scores in thinking and who prefer the evaluation of ideas; and (d) Implementers – individuals who prefer to gain knowledge from experiencing and prefer evaluation of knowledge, and each sits within the four quadrants.

Kirton's adaption-innovation theory. With any of the cognitive styles, there is no one style that is more important than another. Styles or preferences assist individuals, teams, and organizations in understanding how individuals can contribute to the CPS process. Kirton (1976) posited that individuals adapt, or take ideas and improve them, while remaining within the confines of the conditions or context. Others innovate, or find new ideas, by sometimes overturning concepts, breaking current rules, and challenging the current situation (Kirton, 1976). The KAI (Kirton, 1976, 1994) measures three sub traits:

- Sufficiency-Proliferation of Originality (SO) adaptors tend to confine idea generation and are less spontaneous, remaining structured, while innovators prefer to ideate and explore the challenge and possibilities.

- Efficiency (E or EFF) adaptors tend to define a problem through thorough attention to detail, while innovators tend to be not as focused on details but on breakthrough ideas and generating many possibilities.
- Rule/Group Conformity (R) adaptors prefer to work within the rules and guidelines established within a system, while innovators are more likely to focus on the road less taken and do not feel constrained by current consensus.

While this tool is not used in this study, it is best to consider a variety of approaches to CPS to fully understand the foundations of this process. There are studies in Chapter 2 that reference the KAI.

FourSight theory – FourSight breakthrough thinking profile. Puccio's (2002) FourSight, originally called the Buffalo Creative Process Inventory (BCPI) (Puccio, 2002) is theoretically rooted in the Osborn-Parnes CPS (1967) theory. A profile identifies an individual's preference for four thinking styles within the creative process: (a) clarifying, (b) ideating, (c) developing, and (d) implementing. A description of each follows:

- Clarifiers elucidate the challenge or problem by collecting related details and information before exploring solutions. At times, Clarifiers may overanalyze, which may prevent them from proceeding.
- Ideators are imaginative and visionary, but at times, they miss the relevant details.
- Developers prefer to expand improvements to current and alternative solutions. Developers may leave projects unfinished until the optimal state has been reached.

- Implementers, a varied definition from the CPSP (Basadur et al., 1990), feel satisfied when a solution is implemented and the job is complete. Implementers take risks and are action oriented (Puccio & Acar, 2015).

Understanding individual preferences for the cognitive processes within the CPS process can help identify an individual's inclination and, therefore, identify strengths and gaps when approaching problem solving (Ray & Romano, 2013).

Divergent thinking. Divergent and convergent thinking are essential thinking modes woven into each of the stages of the CPS process (Puccio et al., 2005). There are cognitive and attitudinal dimensions that relate to divergent thinking capabilities (Basadur & Finkbeiner, 1983). Two specific attitudes that support divergent thinking are a preference for ideation, which Basadur and Finkbeiner (1983, 1985) referred to as *active divergence* and the *avoidance of premature convergence* or *premature evaluation*. Ideation is generating as many new, imaginative ideas as possible to increase options for solution finding and implementation (Basadur et al., 2013; Puccio & Acar, 2015). High divergence allows for the most creative, imaginative, and far-reaching ideas to be brought forth. Divergent thinkers tend to find new opportunities, look for new solutions, are more customer driven, easier to train, and tend to have a broader outlook (Bonchek, 2016). Low premature convergence allows for ideas to be generated without active criticism and the extinguishing of seemingly impossible ideas, which could offer a new and creative solution (Basadur et al., 1990).

Do attitudes precede behaviors (Noller, 1979; Puccio, Keller-Mathers, Acar, & Cayirdag, 2017)? Research in this area can support the continued relationship between creative problem-solving preferences and attitude for divergent thinking. CPS is a theory

that can allow one to look at the relationship between an individual's problem-solving preference and the attitudes, divergent and convergent thinking, held by an individual (Basadur & Finkbeiner, 1983).

Statement of Purpose

The purpose of this study is to examine the relationship between an individual's expressed creative problem-solving style preferences and divergent thinking attitudes. Creative problem-solving preferences were measured by the FourSight Breakthrough Thinking Profile (Puccio, 2002), and the profile identifies four preferences, Clarifier, Ideator, Developer, and Implementer. Divergent thinking attitudes, preference for ideation, and premature evaluation were measured by the 14 Item Ideation-Evaluation Preference Scale (Basadur & Finkbeiner, 1985). This research study was conducted utilizing the aforementioned tools, both which are valid and reliable instruments.

Research Questions

This study was guided by the question: What is the relationship between an individual's expressed creative problem-solving preferences and divergent thinking attitudes? Creative problem-solving preferences are identified as Clarifier, Ideator, Developer, and Implementer (Puccio, 2002). Further, this study examined how each of the four creative problem-solving preferences predict preference for ideation and avoiding premature convergence, or premature evaluation, which are two divergent thinking attitudes that support creative thinking (M. Basadur, personal communication, July 28, 2016). Specifically, the study answered the questions:

1. Can the four predictor variables significantly predict the outcome variables?
2. Does each individual predictor significantly contribute to the prediction?

3. How much weight does each predictor carry in predicting outcomes?

Potential Significance of the Study

A quantitative study of individuals' preferences for the creative problem-solving process, in combination with divergent thinking attitudes, contributed to the continued research supporting investigation between these variables. This study's findings uncovered relationships for individuals' preferences while solving complex issues, and each preferences' potential attitudes for divergent thinking, which allows for many new and novel insights to be considered throughout the entire creative process. Given divergent thinking's stature as a predictor of creative activity and the call for creative behavior in individuals, across teams, and within organizations, the findings in this study have the potential to:

1. impact hiring processes across many disciplines,
2. support training initiatives to further develop creative individuals and teams,
3. build a continued culture of organizational creativity,
4. contribute to the ongoing focus in research on creative problem-solving preferences and FourSight as an emerging theory for problem solving and creative behavior, and
5. uncover the latent strengths or areas of development that individuals hold in the area of creativity and creative problem solving, not only in the workforce but in society today.

The findings of this study could potentially extend the scope of the previous literature, which did not explore the relationship between individual creative problem-solving preferences and divergent thinking attitudes using the two instruments of this

study. Research has emerged in reference to individual's creative problem-solving styles (Basadur & Head, 2001; Basadur & Basadur, 2011; Kirton, 1976, 1994; Puccio, 1999, 2002; Puccio & Grivas, 2009; Sayeed, 2014). Another strand of research in the field of creative problem solving centers on divergent thinking. Research on the latter is narrowed to two main topics: (a) divergent thinking based on quantity and quality of ideas or products (Reiter-Palmon & Arreola, 2015; Runco, 2006; Runco & Acar, 2012; Runco, Dow, & Smith, 2006) and (b) divergent thinking attitudes that are limited (Basadur et al., 2000; Basadur, Pringle, & Kirkland, 2002; Puccio et al., 2017; Ray & Romano, 2013). The findings from this study can potentially support improvements for individuals, team composition and leveraging human capital, performance, and goal execution across various disciplines in this highly competitive global economy.

This research can lead to an improved understanding and adjustment between one's creative problem-solving preference and divergent thinking attitudes. Findings from the existing literature for individuals and groups support improved performance outcomes for heterogeneous groups (Basadur & Head, 2001; Ray & Romano, 2013). The findings from this study could assist organizations in further understanding human and creative capital, as well as help to develop strategies for places where gaps may exist.

Definitions of Terms

Like the definition for creativity, many of the terms used in this area of study can be defined in a variety of ways. Different terms have different meanings for people across varied disciplines and contexts. Because creativity is multidisciplinary, going forward and for the purposes of this dissertation, the following definitions were used as a reference:

Creative Problem Solver – an individual with a specific mental processing capacity and who is imaginative enough to bring clarity to an ill-defined challenge or design of a novel or original solution (Isaksen et al., 2000; Puccio et al., 2005).

Creative Problem Solving – a mental process that requires imagination to bring clarity to an ill-defined challenge or the design of novel or original solutions (Isaksen et al., 2000; Puccio et al., 2005).

Clarifier – an individual who makes clear the challenge or problem by collecting related details and information before exploring solutions. At times, clarifiers may overanalyze, and that may prevent them from proceeding (Puccio & Acar, 2015).

Developer – an individual who prefers to devise improvements to current solutions and offer alternative solutions. Developers may leave projects unfinished until the optimal state has been reached (Puccio & Acar, 2015).

Divergent Thinking – the process of generating multiple options while deferring judgment.

Divergent Thinking Attitudes – a position or preference for generating multiple options while deferring judgment. Divergent thinking attitudes can be further defined as a preference for ideation and avoiding premature convergence or premature evaluation (Basadur et al., 2009).

Ideator – an individual who is imaginative and visionary (Puccio & Acar, 2015).

Implementer – an individual who feels satisfied when a solution is implemented and the job is complete. Implementers take risks and are action oriented (Puccio & Acar, 2015).

Problem Solver – an individual who has a well-defined, known path to a solution and who may also desire readily-available or proven solutions (Puccio et al., 2011).

Problem Solving – a mental process of seeing a well-defined, known path to a solution and having the desire to use readily-available or proven solutions (Puccio et al., 2011).

Creative Problem-Solving Preferences – the inclination of an individual toward a specific way of seeing a well-defined pattern to a solution. This can also be referred to as style, profile, or preference. For the purposes of this study, *preference* will be used, unless otherwise noted the by the research.

Chapter Summary

This chapter provided background in the field of creativity, specifically, the theoretical framework and history of creative problem solving and the importance of exploring creative problem-solving preferences and their potential relationship to divergent thinking attitudes. The theoretical framework of creative problem solving supports the manifestation of cognitive preferences and divergent thinking attitudes. The foundation of CPS supports the research questions and provides a lens through which to interpret the results. Additionally, the discussion covered the main research question that was used to guide the research design and analysis and made clear the potential significance of this study. The chapter concluded with the definitions of key terms used throughout the research.

The subsequent chapters of this dissertation have specific purposes. Chapter 2 reviews existing literature and theories studied as a way of finding the relationship between creative problem-solving preferences and divergent thinking attitudes. Chapter 3

offers the detailed plan of the research design and methodology including the research context, participants, data collection instruments, and methods. Chapter 4 includes the analysis and results of the findings of the study, and last, Chapter 5 concludes with the discussion of the findings, implications, and recommendations for further research.

Chapter 2: Review of the Literature

Introduction and Purpose

This study examined the relationship between an individual's expressed creative problem-solving preferences and his or her divergent thinking attitudes. As Chapter 1 provided a foundational overview of creative problem solving, creative problem-solving preferences, divergent thinking, and divergent thinking attitudes, Chapter 2 describes the state of the science in the specific areas of creative problem-solving preferences and divergent thinking, using evidence drawn from an extensive literature review. This chapter provides a review of the empirical findings in the peer-reviewed literature and an overview of the general search strategy utilized in this literature review process. The introduction of this section provides the context for the research topic and a detailed description of the search for relevant empirical findings that illustrate changes in the topic over time and that confirm prior findings. Last, the introduction and purpose sections are followed by the review of the literature and chapter summary sections.

Review of the Literature

This section highlights how existing studies have changed the state of the literature and have confirmed prior findings about creative problem-solving preferences and the topic of divergent thinking, specifically in the workplace. This section also includes the characteristics of the studies and the synthesis of this literature.

Characteristics of the included studies. Creative problem solving is not domain specific and reaches across many disciplines. The peer-reviewed literature includes

studies conducted across many disciplines and with a variety of participants. The articles in this review were from diverse settings that include secondary education (8.3%), higher education, specifically, MBA studies and graduate programs (41.7%). Almost half of the studies include an international consumer-goods manufacturer (8.3%) and a hospital (8.3%), and three studies involved a cross section of more than 38 professions and a wide span of organizational levels (33.3%), from lower-level management to senior-level management. The peer-reviewed literature included in this review have publication dates from 2000-2016. This is, in part, due to recent developments of the newer construct of creative problem-solving styles (Selby, Shaw, & Houtz, 2005) and a more recent return to a focus on divergent thinking—not as an indicator of creativity, but as a potential for creative problem solving (Runco & Acar, 2012).

Most of the studies were performed in the United States; however, three studies were conducted outside the United States, taking place in India, Brazil, and Poland. Three studies did not indicate a specific location. Participants included males and females, professionals, students, and graduate students. Seven studies had a primary or secondary focus on organizational levels, such a low-level management to senior- and executive-level management. While gender was reported in some studies, gender was not addressed otherwise. These studies focused on creative problem-solving styles or preferences and divergent thinking. Most studies were quantitative in design, with the exception of one mixed-methods study through which graduate students were assessed using a pre- and post-inventory instrument, and they answered follow-up questions about their experiences. Methodologies are covered more extensively in a subsequent section.

In summary, creative problem-solving preference and divergent thinking studies are broad in nature, spanning across the globe and throughout a variety of disciplines. The evidence of this in the existing literature supports the vast interest in areas pertaining to creativity and creative problem solving, specifically incorporating creative problem-solving preferences, and divergent thinking. Appendix A shows a summary of the literature used for this review.

Synthesis of the studies. This section provides a summary and a synthesis of the peer-reviewed literature and the studies contained within these articles. The scientific literature is broken into two major sections: creative problem-solving styles and divergent thinking. Of the articles reviewed, 10 reflect creative problem-solving styles, and five reflect divergent thinking. Some of the articles overlapped in topic areas in relation to the main research question and the state of the science, providing results that were reported in one or more areas of this paper. While the focus was on creative problem-solving styles and divergent thinking, the synthesized literature narrowed the scope of these topics into five main categories: (a) creative problem-solving styles across professions, (b) creative problem-solving styles within organizational level, (c) relating traits to creative problem-solving styles, (d) creative problem-solving styles and team performance, and (e) divergent thinking.

Creative problem-solving styles across professions. Creative problem-solving styles are present in a cross section of professions (Basadur, & Basadur, 2011; Basadur, Gelade & Basadur, 2014; Sayeed, 2014). Each of the studies included in this section investigated the distribution of creative problem-solving styles across various professions, which were identified using the CPSP or the KAI. While creative problem-

solving styles were identified using varied instruments, there are connections that can be drawn from the literature about creative problem-solving styles and various professions (Basadur, & Basadur, 2011; Basadur et al., 2014; Sayeed, 2014).

Industry-related professions seem to be lacking in individuals who are able to use knowledge for idea generation (Basadur & Basadur, 2011). Field research conducted with 3,942 participants, identified as full-time professionals, found that Generators—individuals who have higher scores in experiencing and ideation, are in professions such as teaching (56%), academia, (38%), art-related fields (34%), and training (32.5%) (Basadur & Basadur, 2011). A similar study was conducted with 6,091 participants, identified as full-time employment or MBA students, with the CPSP administered to find the distribution of styles in a cross section of 38 different professions (Basadur et al., 2014). To contrast, Generators were not found to be as highly populated in fields such as information technology (IT), manufacturing, engineering, and strategic planning (<10%) (Basadur & Basadur, 2011). Understanding the foundational idea that each new solution to a problem can present a new challenge can pose a challenge in business and industry because Generators are integral in seeking out new opportunities resulting from current challenges.

In contrast, industry-related professions had higher populations of Optimizers, Conceptualizers, and Implementers. Optimizers were the highest population among engineers, engineering design, manufacturing engineering, and finance (43% to 36.2%, respectively) (Basadur et al., 2014). Conceptualizers provided further analysis of problems by thinking and utilizing ideation and were represented by fields such as

strategic planning, design, market research, and research and development (R&D) (56.5% to 47.4%, respectively). Conceptualizers are individuals who use knowledge for ideation.

Implementers have higher scores in experiencing and evaluation, experimenting with solutions, and making adjustments to implement the solution (Basadur et al., 2014). Implementers were found in positions that achieve short-term and immediate results, such as IT operations, secretaries/administrative support, project managers, and those in sales (64.1% to 42.6%, respectively). These results could be related to the nature of the work in these more technical fields, or with selection processes to obtain employment in the industry, which could be defined as more detail-oriented and process-driven, and where solutions are sought and implemented (Basadur & Basadur, 2011).

Similar to Basadur and Basadur (2011), Sayeed (2014) sought Adaptors and Innovators throughout certain professional roles in India. Adaptors are those who prefer to work within the confines of the current situation, and Innovators prefer to break through the status quo with new ideas. The style results of the KAI are reported on a continuum. Previous studies found that Indian professionals tended to be high Adaptors, in comparison to their Western counterparts who were found to be higher Innovators (Sayeed, 2014).

In the study exploring creative problem-solving styles across various professions, Sayeed (2014) focused on outcomes from 417 Indian participants across three different professional groups: (a) entrepreneurs who ran an organization as top management (n = 30); (b) knowledge workers such as doctors, teachers, nurses, pilots, and legal professionals (n = 254); and (c) managers with oversight of people and tasks (n = 133). Interestingly, none of the groups showed a difference in originality score on the

sufficiency-proliferation of originality (SO) subtest, and this resulted in a low preference to ideate and explore possibilities. This is similar to both of the previous studies' outcomes where business and industry lack Generators, or those who use information to seek new opportunities (Basadur, 1994). However, the entrepreneurs resulted in a higher mean value for total adaption-innovation ($M = 3.01$; $F = 6.82$; $p < .001$). This finding supported the entrepreneurs' nature to create in unstructured situations and find unique ways to challenge strategy (Sayeed, 2014).

Knowledge groups were broken down into various groups of professionals (doctors, computer specialists, pilots, nurses, cabin crew). The professionals' scores differed significantly, such as doctors ($p < .001$), managers ($p < .001$), nurses ($p < .05$), and cabin crew ($p < .05$), against the standard score of 96, which indicated adaption, rather than innovation (Sayeed, 2014). These findings seem to point to a gap in innovation in professions other than entrepreneurs. Individuals in these fields might think more incrementally, rather than revolutionary, or they may disrupt the status quo, which may be due to the nature of the profession (Sayeed, 2014). Adaptors refine and embrace the conditions that surround them, while Innovators prefer to challenge the norms and look outside of the parameters of the current situation for solutions.

A focus on styles in the workplace, specifically across occupations, offers evidence for the strengths and diversity in creative problem solving across various professions (Basadur & Basadur, 2011; Basadur et al., 2014; Sayeed, 2014). In the absence of any problem-solving style, a full creative problem-solving process will not be complete (Basadur & Basadur, 2011; Basadur et al., 2014). Creative problem-solving

styles are not only a focus within professions but at organizational levels, as well. The next section highlights these findings of the researchers in the literature.

Creative problem-solving styles within organizational levels. The four studies in this section of the chapter relate creative problem-solving styles to organizational levels (Basadur et al, 2014; Puccio & Acar, 2015; Sayeed, 2014). Creative problem-solving styles are of recent interest and were identified using the KAI, CPSP, and FourSight.

These studies suggest that varying organizational levels, from low-level management to higher level and senior management, reflect different creative problem-solving styles. As peoples' roles increase in seniority, there seems to be an increase in styles reflective of implementation, ideation, and conceptualizing. Puccio and Acar (2015) reported high levels of Implementers and Ideators across more senior leadership positions from a sample of 7,280 participants across the private and public sectors. There were significant differences found for Implementer ($p < .001$) and Ideator ($p = .001$) styles, but not for Clarifier ($p > .05$) or Developer styles ($p > .05$) among the higher levels of management (Puccio & Acar, 2015). When higher level management (director, vice president, and executive) and lower level management (non-management, supervisor, and middle management) were compared ($p < .001$), Implementers and Ideators remained the most significant creative problem-solving styles. Recall that Implementers and Ideators are those who prefer risk-taking and are visionary, respectively, which are characteristics reflective of higher level management.

Similarly, Basadur et al. (2014) found upper management and professional/technical fell into the Conceptualizer styles (35.9%) of those who "lead in

giving sound structure to fledgling ideas and underdeveloped opportunities" (Basadur & Basadur, 2011, p. 34). Conceptualizers show a preference for apprehension of knowledge by thinking and ideation (Basadur & Basadur, 2011). Significant differences at the highest levels of senior managers and professional/technical positions reflect individuals who have an increased preference for thinking and ideation, rather than experiencing and evaluation (Basadur et al., 2014). This is possibly due to the nature of the demands in upper management roles to better structure challenges and more clearly develop ideas and projects.

To contrast, Generators were the least represented in management positions, with 17.9% in upper management to 19.9% in supervisor/team leader roles (Basadur et al., 2014). Implementers, those who prefer to put solutions into action, and Conceptualizers, those who prefer to develop solutions, were the highest populations for middle-management positions. Sayeed (2014) reported that uncategorized managers with high dimensions for Adaptors are those who prefer handling situations within the confines of the challenge, while being specific and direct. This may be reflective of the work defined by managers to conduct task handling, interactions, and short-term problem solving entailed in this position (Puccio & Acar, 2015; Sayeed, 2014). These results are contrary to the results of the higher-level management reported by Basadur et al. (2014) and Puccio and Acar (2015). However, Puccio and Acar (2015) found higher levels of Clarifiers, those who prefer fact-finding for problem solving, in the higher levels of management in the private sector. Uniformly, these studies point to a stratification of creative problem-solving styles within management, and even within upper and lower management.

Relating traits to creative problem-solving styles. Research continues to define creative problem-solving styles, particularly in the following three studies through the use of the KAI and FourSight (Kwang et al., 2005; Puccio and Grivas, 2009; Puccio & Chimento, 2001). The studies paired the exploration of creative problem-solving styles with additional instruments, the DiSC (Martsen, 1928) and Schwartz's value inventory (Schwartz, 1992,1994) both are commonly used psychological tools to get to know better oneself or another. These studies deepened the understanding of creative problem-solving styles and traits each style can potentially exhibit or align to.

Overall, these three studies suggest that there are traits that certain creative problem-solving styles exhibit and align to that style. For example, Puccio and Grivas (2009) conducted a study of 137 participants of a hospital leadership team, ranging from department head to senior leadership, and they found that creative problem-solving styles had significant relationships for 7 out of 16 correlation coefficients, reflecting four FourSight scales and four DiSC dimensions. Kwang et al. (2005) conducted a study of 243 students at the university level from Singapore and 195 students from Australia, and results showed significant correlations between problem-solving styles that were identified by the KAI and Schwartz's values inventory (1992, 1994). Adaptors, according to the KAI, prefer to work within the confines of the current situation, and Innovators prefer to break through the status quo with new ideas (Kwang et al., 2005). Kwang et al. found that Adaptors (Singaporean and Australian) were more likely to align to conservation, specifically defined by conformity, security, and tradition ($p < .05$, Australian students; $p < .0001$ for Singaporean students).

In the Kwang et al. (2005) study, Innovators were more likely to align with openness, which is defined by self-direction and freedom ($p < .0001$, Australian students; $p < .05$). Previously correlated ($p < .001$), Ideators can be compared to Innovators (Puccio, 2002). In the study of traits conducted by Puccio and Grivas (2009), Ideators and Implementers, individuals who prefer to move quickly toward a solution, were found to be significantly correlated ($p < .01$ and $p < .05$, respectively) with the trait of Dominance, or they could be seen as ambitious. Traits for Innovators, Ideators, and Implementers seem to be related. Similar relationships can be drawn from the data for Clarifiers and Adaptors, closely related, as those who attend to the details of the current situation or seek an understanding of the situation before moving toward a solution (Kwang et al., 2005; Puccio & Grivas, 2009). Clarifiers were significantly correlated with conscientiousness, or those who have high scores in this category are accurate, careful, cautious, and exacting (Puccio & Grivas, 2009). Recall, Adaptors, as defined by the KAI, are individuals who prefer to work within the confines and rules set in the current situation (Kwang et al., 2005).

In a third study, by Puccio and Chimento (2001), individuals not trained in creativity (laypersons) and college students blindly rated Adaptors and Innovators as more or less creative by examining characteristics or traits of each style. A second population of undergraduate students, enrolled in creativity courses, took part in the same task (Puccio & Chimento, 2001). The students were administered the KAI. The purpose of this was to look at a relationship of one's individual style of creativity and implicit perceptions of style (Puccio & Chimento, 2001). The Innovator characteristics were rated higher by all groups and significantly higher among the Innovator group ($p < .03$).

Perceptions of creativity and creative problem solving could be drawn from traits that individuals exhibit. The previous three studies in this section drew connections between an individuals' exhibited traits and the relationship to the creative problem-solving style or preference.

Creative problem-solving styles and team performance. As illustrated in previous studies in this review, individuals have varied creative problem styles and dimensions found within those styles. The following extends the research on individual creative problem-solving styles to team performance. CPS styles can impact team performance. In consideration of previous studies, one could hypothesize that interactions between various CPS styles and given traits could impact performance. The following studies posited that reported outcomes would be directly related to the composition of the teams (Basadur and Head, 2001; Puccio, Wheeler, & Cassandro, 2004; Ray & Romano, 2013).

According to the findings in a study conducted by Basadur and Head (2001), team performance was affected by the distribution of creative problem-solving styles within the team, or the absence of them. Heterogeneous teams, composed of a cross section of styles, outperformed homogeneous or semi-homogeneous teams on an open-ended creative problem-solving task. The study was conducted with 196 MBA students to investigate the outcomes of groups with various blends of cognitive styles (Basadur & Head, 2001). The resulting mean scores of the heterogeneous group were significantly higher than those of the homogeneous and semi-homogeneous teams overall (4.22 vs. 3.69 vs. 3.76, $p < .05$) (Basadur & Head, 2001). This is an important finding in consideration of these results and those reported and previously referenced. It highlights

the value of varied styles not only across various occupations, but within teams, as well. If teams do not consist of Conceptualizers and Implementers, or varied styles, it could be posited that these significant differences might not have occurred (Basadur & Head, 2001).

Generalizations about team composition cannot be made when considering the results of a study of 250 university business students (Ray & Romano, 2013). Teams were composed similarly to the semi-homogeneous groups of Basadur and Head (2001), and the participants completed an open-ended, real-world problem-solving task. The Ideators, Conceptualizers, and Generators, those who prefer using knowledge for ideation, were grouped together as the Ideators, and the Implementers and Optimizers, who prefer to use knowledge for evaluation, were grouped as the Evaluators (Ray & Romano, 2013). The Ideators performed significantly better than Evaluators in idea fluency, idea flexibility, idea elaboration, and idea originality ($p < .05$). These findings conflicted with Basadur and Head's results, except in the area of action planning, where the semi-homogeneous groups performed significantly higher ($p < .05$). However, the exact composition of the semi-homogeneous groups was unknown (Ray & Romano, 2013). In the Basadur and Head (2001) research, the semi-homogeneous groups were defined as groups with two dominant styles present out of four, but the styles represented within the semi-homogeneous teams were not reported.

Additionally, measures were taken for team satisfaction (Basadur & Head, 2001). Interestingly, *enjoyment of working together* was highest in the homogeneously grouped teams (Basadur & Head, 2001). Three measures indicated that people enjoyed working on semi-homogeneous teams. Scores were significantly higher for this group than for the

heterogeneous groups in three categories: (a) *ease of working together*, (b) *willingness to work together*, and (c) *satisfaction of output* ($p < .05$) (Basadur & Head, 2001). While the last measure could seem trivial, it is important to note that teams that have a heterogeneous construction could pose differences within a team due to composition of varied thinking styles. These findings could have implications for the workplace, as teams of individuals come together to work on a common challenge or goal (Basadur & Head, 2001; Puccio & Grivas, 2009).

A study was conducted by Puccio, Wheeler, & Cassandro (2004) of 84 students enrolled in CPS courses. Student responses were collected in answer to components of CPS, stages, principles, and tools. A relationship between the students' FourSight profiles and these same elements of the courses was investigated to seek associations between styles and preferences to the CPS components. Overall, students rated Generating Ideas the highest in the stages of CPS ($M = 2.46$, $SD = 1.69$), along with Defer Judgment ($M = 3.56$, $SD = 2.65$), and Divergent Thinking ($M = 3.86$, $SD = 2.97$), as principles. This is in contrast to the Plan for Action, as a stage ($M = 4.58$, $SD = 1.42$), and Be Deliberate ($M = 8.63$, $SD = 2.67$), as a principle, which was the lowest (Puccio et al., 2004). These findings illustrate a preference in the group for ideation, a divergent thinking foundation. Puccio et al. (2004) noted that differences between the lowest and highest ratings exemplified the enjoyment of divergent thinking among the participants.

In the Puccio et al. (2004) study, student styles revealed, through a regression analysis, that style preferences had significant relationships with various stages and other CPS components. For example, Ideators, or those with a preference for idea generation, showed an enjoyment and placed greater future value on the components of CPS, such as

Preparing for Action ($p < .05$), and while not a significant relationship, a positive relationship to Exploring the Challenge. Looking further at Defer Judgment, Ideators, those who prefer idea generation, and Clarifiers, those who prefer to gather details, showed significant negative relationships ($p < .05$) as a principle (Puccio et al., 2004). In contrast, Developers, who prefer solution development, showed a significant relationship for the enjoyment and future value of Defer Judgment ($p < .05$). These mixed results warrant further investigation as to whether individuals might prefer elements of CPS that contrast their preferred problem-solving style, or where they may have a potential gap in their thinking and style.

Overall, these studies report findings that, with improved focus on individual style and individuals as contributors to the work place and teams, creative problem-solving work can be facilitated with the correct tools and style distribution. The study teams experienced further enjoyment of working together and complemented each other's thinking and styles. The individuals and teams in the workplace were more effective with a focus on the many facets of CPS presented in this section of the literature review (Basadur and Head, 2001; Puccio, Wheeler, & Cassandro, 2004; Ray & Romano, 2013).

Divergent thinking. Within the stages of CPS, there is a mini-thinking process categorized into two major phases: divergence or ideation, and convergence or evaluating (Basadur, 1994; Basadur & Finkbeiner, 1983; Puccio et al., 2017). These thinking processes are recursive patterns (Brophy, 1998; Runco & Chand, 1994). These processes, or as Basadur & Finkbeiner (1985) referred to them, *attitudes*, can be measured. Reflected in the research, divergent thinking is often measured as a product by fluency of ideas, originality, and flexibility of ideas (Runco, 2006; Runco & Acar, 2012; Runco et

al., 2006). In the literature, six studies explored different facets of divergent thinking (Basadur et al., 2000; Basadur et al., 2002; Clapham, Cowdery, King, & Montang, 2005; Puccio et al., 2017; Ray & Romano, 2013; Reiter-Palmon & Arreola, 2015). The literature revealed two different ideas about divergent thinking: (a) divergent thinking can impact the full creative problem-solving process, and (b) attitudes for divergent thinking can be measured and impacted by training.

Divergent thinking in the CPS process. Divergent thinking is a core process related to creative problem solving. Four empirical studies informed the influence of divergent thinking on the creative problem-solving process (Basadur et al., 2000; Clapham et al., 2005; Ray & Romano, 2013; Reiter-Palmon & Arreola, 2015). The four studies approached this topic differently and tasked each participant with not only generating ideas but evaluating the ideas, as well. The recursive process of the divergent and convergent thinking element completes the creative process (Parnes et al., 1977). Ideators, or those with a preference for idea generation, were more successful in generating more ideas and producing more original ideas than participants or groups associated with the evaluation (Basadur et al., 2000; Clapham et al., 2005; Ray & Romano, 2013; Reiter-Palmon & Arreola, 2015). However, the quality of the outcomes and products within the studies appeared inconclusive.

In the Basadur et al. (2000) study, managers ($N = 112$) of a large international consumer goods manufacturer were broken into two groups and tasked with generating and selecting solutions for two realistic problems. One group was exposed to a Simplex creative problem-solving training prior to completing the task. In a two-day, hands-on Simplex training, participants were encouraged to value ideation-evaluation and apply

this foundational thinking, while finding and defining his or her own problems, solving those problems, and preparing for implementation following the training (Basadur et al., 2000). The other group completed the task, without the training. Ideational attitudes were measured for both groups before and after the training. Analysis of the results identified a significant relationship between the ability to generate many ideas, quantity/ideational skill, and the quality and originality of ideas ($p < .01$) for the trained group (Basadur et al., 2000). Divergent thinking training also resulted in a significant increase for the trained group, in comparison to the untrained group, in the ability to generate many ideas, ideational skills, and produce original ideas ($p < .01$) (Basadur et al., 2000).

A two-part, creative problem-solving study of homogenous groups, sorted by preferences toward ideation or evaluation, reported a similar result (Ray & Romano, 2013). Using a two-phase investigation, 12 Ideator groups and 27 Evaluator groups were formed, as the independent variable, using the CPSP to identify individual preferences. In the first part of the study, two groups completed a real-world divergent thinking task. Significant differences for the Ideator group were reported in the areas of idea fluency, flexibility, and originality, reflecting their preference for idea generation ($p < 0.05$). In the second part of the study, group members rated group ideas for novelty, feasibility, and effectiveness (Ray & Romano, 2013). The results of the evaluation or convergent phase showed a significant performance difference for the Evaluator group in one out of three quality measures in this phase ($p < 0.05$) (Ray & Romano, 2013).

Reiter-Palmon and Arreola (2015) also conducted a study of 187 university students, comparing divergent thinking and creative problem solving, and they reported similar and contrasting results to the Basadur et al., (2000) and Ray & Romano (2013)

studies. Two groups, one of divergent thinking task participants ($N = 187$), were given a real-world problem to generate as many possible solutions as they could. A second group ($n = 176$) were given the same task, but they were asked to generate one creative best solution (Reiter-Palmon & Arreola, 2015). Each outcome was rated for quality and originality by four trained raters. Similar to the previous studies, the divergent thinking participants produced, on average, more ideas ($p < .05$), and the divergent thinking participants had the highest rated original idea ($p < .05$). In contrast to the Basadur et al., (2000) and Ray & Romano (2013) studies, the group producing just one best or most-creative solution significantly outperformed the divergent task group in average quality ($p < .01$) and highest rated quality ($p < .01$) (Reiter-Palmon & Arreola, 2015). As illustrated by the complexity of the studies, the scope of measurements, and the variability in the results, divergent thinking offers breadth and depth of influence in the process of creative problem solving.

Last, a longitudinal study was conducted among engineers, across 15 years, to seek a relationship between divergent thinking scores and predicting creative work activities (Clapham et al., 2005). In this case, predictive work activities were self-reported using a questionnaire built for the study inquiring around patents, creative work environment and work activities, work satisfaction, and work compatibility (Clapham et al., 2005). The study was hopeful in shedding some light on divergent thinking and creative outcomes. While the results were limited, there were many positive outcomes linking divergent thinking and creative activity. As engineering students, 30 out of 57 participants took part in divergent thinking tests, and they were followed up with completing a 9-item, self-reporting questionnaire, responding to questions about the

participants' employment situations at that time. The results revealed the Owens's applications subtest, a test of divergent thinking where participants are asked to find or imagine as many uses for a series of mechanical devices as possible, were significantly correlated with creative work activities ($p < .05$) and patents ($p < .01$).

Many scores showed positive relationships but there was nothing further discovered in significance (Clapham et al., 2005). Positive associations were found specifically between creative work environments, patents, and creative work activities, work satisfaction, work compatibility, and outcomes for the Owens's applications subtest (Clapham et al., 2005). These findings suggest that domain-specific divergent thinking (engineering) can predict engineers' self-rating level of creativity. This study does demonstrate the longevity of divergent thinking and adds to the validity of divergent tests (Clapham et al., 2005). This study, in consideration of previous studies in this review, focused on professions supporting the predictive nature of divergent thinking. This may be of particular interest to organizations that want to leverage creative performance in key positions. These results, coupled with those of the studies across various professions, could help individuals and organizations strengthen creativity in the workplace.

Attitudes for divergent thinking. Research about divergent thinking attitudes is limited. Two quantitative studies and one mixed-methods study documented improved outcomes for individuals and their increased divergent thinking attitudes following training or education about creative problem solving, as it pertained to divergent thinking attitudes (Basadur et al., 2000; Basadur et al., 2002; Puccio et al., 2017). The two identified divergent thinking attitudes were: preference for active divergence and preference for premature convergence (Basadur, 1994; Basadur et al., 2000). The

preference for active divergence, or preference for ideation, is referred to as *deferring judgment* (Basadur & Finkbeiner 1985; Puccio et al., 2017). This is explained as the ability or openness to new and sometimes more outlandish ideas (Puccio et al., 2017). The attitude to actively avoiding premature criticism, or avoid quickly criticizing original ideas, is measured in the literature as a tendency for premature evaluation (Puccio et al., 2017). This is reported numerically, in which it is favorable to see a decreased score, due to the desire to avoid premature judgment or criticism (Basadur et al., 2000; Basadur et al., 2002; Puccio et al., 2017). For the purposes of this discussion, *preference for active divergence* is referred to as *preference for ideation*, and *preference for active convergence* will be referred to as *premature evaluation*.

Each of the three studies (Basadur et al., 2000; Basadur et al., 2002; Puccio et al., 2017) posited that participants would improve in the measures of two ideational attitudes, the preference for ideation and avoiding premature evaluation. To seek an understanding of improvements in attitudes and ideation related to divergent thinking, Basadur et al. (2000) conducted a study of 112 participants, lower through upper level managers employed by a large international consumer-goods manufacturer. In addition, Basadur et al. (2002) conducted a quasi-experiment with 149 South American managers to seek results comparable to American and Japanese counterparts. Puccio et al. (2017) conducted a similar study of 60 graduate students to measure the outcomes for divergent thinking principles, following a graduate class sequence over the course of approximately a year. The pre- and post-data for all studies were collected using the Basadur 14 Item Ideation-Evaluation Preference Scale.

The findings were positive for the outcomes of the trained individuals, in varied manners, for divergent thinking outcomes, specifically changed attitudes for preference for ideation and premature evaluation (Basadur et al., 2000; Basadur et al., 2002; Puccio et al., 2017). All studies reported significant findings with subjects demonstrating improved scores. Specifically, positive significant gains were seen in a quasi-field experimental group of South American managers following training ($p < .05$) for preference for ideation. No significant gains were found for the nonequivalent placebo group, yet this group was made up of a similar cross section of the trained group. Likewise, the trained group resulted in a significant decrease ($p < .01$) for preference for premature evaluation (Basadur et al., 2002). Recall was reported as negative because the ideal was to see a preference for premature criticism decrease. The nonequivalent placebo group had no change in results. The gains for avoiding premature criticism were similar to the outcomes for the participants North American and Japanese counterparts (Basadur et al., 2002), but they were not significant.

Basadur et al. (2000) reported similar findings in a study of a population of 112 managers of a large, international consumer-goods manufacturer. Significant increases were reported in this population for preference for ideation ($p < .01$) and (avoiding) premature evaluation ($p < .001$). Graduate students, following coursework, showed an increase in the preference for ideation ($p <.001$), and the students showed a significant decrease ($p < .001$) in premature evaluation after taking part in coursework, which was focused on principles in creative problem solving, creativity, and change leadership (Puccio et al., 2017). These increases were significant in the data comparison before and after the training or year-long coursework.

In addition to the quantitative results obtained from graduate students in the Puccio et al. (2017) study, qualitative reports enhanced the researchers' understanding of the graduate students' changed attitudes and beliefs about creativity, specifically their preferences for ideation and decreased premature evaluation. The students reported experiences answering questions about how their attitude for creativity changed and how the program impacted their personal growth). The responses reflected themes within the study of creativity:

- Creativity is a necessity for problem solving.
- There are certain skills associated with creativity.
- There are distinct effective and thinking skills for creativity (Puccio et al., 2017).

These studies reflect development in the understanding of the thinking and attitudes that are foundational in creative problem solving. This area of focus demonstrates a shift in the investigation of creative problem solving, from understanding the output or performance to investigating the deeper cognitive processes that go on within the stages of CPS. The results of these studies indicate a marked increase in the preference for ideation and a decrease in premature evaluation following training in creative problem solving (Basadur et al., 2002; Puccio et al., 2017). Growth in divergent thinking attitudes can increase one's ability to be open to novel and diverse ideas and maximize creating solutions through the CPS process.

A review of the existing empirical literature in the areas of creative problem solving, precisely preferences and styles, and divergent thinking, with a focus on attitudes, reveals gaps that create research opportunities. Many of the studies focus on

teams or individuals within a team setting. The existing studies focus on creative output, a product, or performance, rather than thinking preferences or styles in relationship to the divergent attitudes that support or negate creativity. The studies included in this review used a variety of tools and instruments, which will be presented subsequently. An extensive review of the literature revealed limited studies utilizing and pairing the FourSight Breakthrough Thinking Tool and the Basadur 14 Point Ideation-Evaluation Preference Scale at the individual level. A proposed study could focus on the relationship between an individual's expressed creative problem-solving preferences and divergent thinking attitudes.

Methodological Review

This literature review provided the current state of the science in creative problem-solving styles and divergent thinking. The following section provides a review of the methods and measures used in the empirical studies identified in this chapter. Methodologies and measures found in the existing literature will be more deeply discussed and reviewed.

Methods. Quantitative research is largely underpinned in a positivism foundation, an "objective reality can be expressed numerically" (Joyner, Rouse, & Glatthorn, 2013, p. 73). Many creativity studies have set out to investigate patterns of human behavior in relationship to ideas such as creative problem-solving styles and divergent thinking. The majority of studies in this literature review are quantitative in nature (93.3%). Thus, much effort and care has been employed in measuring styles and attitudes and in examining the relationships objectively. The overall research question, "What is the relationship between an individual's expressed creative problem-solving preference and divergent

thinking attitudes?" poses a relationship between constructs, which confirms the topic's placement amidst the quantitative research.

Measures. The articles included in this literature review are primarily quantitative in nature. Instruments, inventories, and tools were used to measure and quantify the investigations into human behaviors and creativity, specifically, creative problem-solving styles and divergent thinking. In all, nine different measurement tools were used. Three different tools were used to find individual creative problem-solving styles, two different tools were used as tests for divergent thinking, and one tool was used to measure divergent thinking attitudes, specifically. Two different instruments were used to find individuals' traits or characteristics. The latter were used in comparative studies, and they were referenced but it is not the focus of this study. Last, judges were engaged to rate the products and outcomes for divergent thinking and creativity in four studies. Table 2.1 is a summary of the measurements used in the empirical research for this review.

Creative problem-solving styles. In the literature, the most frequent measurements of the researchers' day were used to establish individuals' creative problem-solving styles. The tools were (a) CPSP (Basadur et al., 1990), (b) FourSight: The Breakthrough Thinking Tool (Puccio, 2002), and (c) Kirton's KAI (1976). All inventories are reported as valid and reliable instruments for use. The CPSP is a self-reporting inventory in which participants are given 12 sets of four words to rank according to his or her own creative problem-solving style. The words are related to the four dimensions of CPS, defined by Basadur et al. (1990). This inventory was used in four different studies. FourSight (Puccio, 2002) is a self-reporting inventory, using a 5-point scale to rate 36 statements, and it was used in two studies.

Table 2.1.

Measurements/Tools Used Within the Studies and Frequency of Use

Construct	Instrument	Frequency
Creative Problem-solving styles	Creative Problem Solving Profile Inventory (Basadur et al., 1990)	5
	FourSight Breakthrough Thinking Tool (Puccio, 2002)	3
	Kirton's Adaption-Innovation Inventory (1976)	3
Divergent Thinking	Basadur's Ideation-Evaluation Preference Scale (Basadur & Finkbeiner, 1985)	3
	Owens's Creativity Tests (1960)	1
	Structure of Intelligence Learning Abilities Test: Evaluation, Leadership and Creative Thinking (Meeker & Meeker, 1985)	1
	Independent, trained judges	3
Creativity Traits	DiSC (Martson, 1928)	1
	Schwartz value survey (1992, 1994)	1

Individuals reported responses ranging from *not like me at all* to *very much like me* (Puccio, 2002). The Kirton KAI (1976) is a self-reporting measure with 33 items, wherein the first item is not scored (blind item). Each item consists of five alternatives to be scored. This tool was used in three of the studies (Kwang et al., 2005; Puccio & Chimento, 2001; Sayeed, 2014).

Traits of individuals. Two studies investigated the creative problem-solving styles of an individual and sought relationships to the varied styles they reflected (Puccio & Grivas, 2009; Kwang et al., 2005). The DiSC (Martson, 1928) is a self-reporting tool. Participants reply to 28 sets of adjectives and identify the best and the least descriptive word to reflective of themselves (Puccio & Grivas, 2009). The Schwartz value inventory

(1992, 1994) consists of 56 personal values that participants rank on a 9-point scale, zero being least important (Kwang et al., 2005). In a study of Singaporean and Australian university students, only five values, ordered in two higher order groups were used. The higher order groups were Conservation and Openness to Change (Kwang et al., 2005).

Divergent thinking attitudes. The Basadur (Basadur & Finkbeiner, 1983) 14 Item Ideation-Evaluation Preference Scale was used in three studies and measured the key divergent thinking principles, preference for ideation, and preference for evaluation, specifically, deferring judgment and avoiding premature evaluation (Basadur et al., 2000; Basadur et al., 2002; Puccio et al., 2017). Six items reflect preference for ideation, and eight items reflect premature critical evaluation. This instrument is valid and reliable.

Divergent thinking. In a longitudinal study conducted by Clapham et al. (2005), two divergent thinking tests were administered: the Owens's Creativity Tests (Owens, 1960) and the Structure of Intelligence Learning Abilities Test (SOI): Evaluation, Leadership and Creative Thinking (ELCT) (Meeker & Meeker, 1985). Both are paper and pencil tests. The Owens's Creativity Test (Meeker & Meeker) looks at the total number of solutions and the total number of workable solutions. It also asks test takers to think of as many possible uses for a series of mechanical devices. This test is valid and reliable when applied to engineers in mechanically-related jobs (Clapham et al., 2005). The SOI ELCT is a test designed for the general population, and it assesses divergent thinking, specifically, symbolic, figural, and semantic applications. This test's scores include fluency, flexibility, and originality. This test, too, has good interrater reliability and construct validity (Clapham et al., 2005).

Creative outcomes. Creative thinking, specifically, divergent and convergent thinking, were measured in three studies (Basadur et al., 2000; Basadur & Head, 2001; Ray & Romano, 2013). To rate creative products, or output, external judges were employed. This is a common practice in assessing outcomes of individuals or teams when problem solving. Interrater reliabilities were determined prior to the products or outcomes being assessed.

Qualitative data. One study was categorized as mixed methods (Puccio et al., 2017). In addition to quantitative measures, students were asked to reply to four open-ended questions. These questions offered rich experience detail from the students' points of view about changes as it pertains to creativity and creative problem solving. The data were transcribed and categorized thematically by findings (Puccio et al., 2017).

To summarize, this literature review included 15 empirical studies reflecting the topic of creative problem solving, specifically, creative problem-solving styles and divergent thinking. The majority of these studies utilize a quantitative approach to inquiry, with one study reflecting a mixed methodology. The studies used seven measurements for investigation. These measurements can be found in Table 2.1.

Substantive Gaps and Recommendations for Further Review

This section of the chapter describes the current gaps and limitations in the empirical studies on the topic of creativity, specifically, creative problem-solving styles and divergent thinking. The studies in this literature review covered a wide variety of populations, settings, and had varied outcomes which provide opportunities for further research in these areas. The gaps and limitations in the empirical studies used for this literature review were found primarily in the following areas: (a) methodology, (b)

organizational settings, and (c) limited research on divergent thinking attitudes. Each of these areas will be reviewed for gaps. The limitations and considerations for further research is spelled out in Chapter 5.

Methodology. A wide variety of subjects were used as participants in the studies used for this literature review. Yet, 50% of the studies included participants from higher education. This seemed to be the result of convenience sampling. Convenience sampling is the recruiting of participants who are easy to reach (Huck, 2012). In two of the studies, Kwang et al. (2005) and Puccio et al. (2017), the participants were state college and university students. The populations seemed to be selected and considered for the studies. Reported differences were mentioned in the findings. In addition, unless simple random sampling has occurred, samples can fall symptom to bias (Huck, 2012). This might have been the case in the samples coming from higher education, as well. For example, graduate students in creativity coursework may have been overrepresented in the samples than those not attending creativity coursework. To avoid this, samples beyond higher education should be considered.

The remaining samples were conducted within business or industry (Basadur & Basadur, 2011; Basadur et al., 2014; Basadur et al., 2002; Basadur et al., 2000; Basadur & Head, 2001; Puccio & Acar; 2015; Puccio & Grivas, 2009; Sayeed, 2014). Three studies narrowed the population to organizational levels, lower to higher level management (Basadur et al., 2014; Puccio & Acar, 2015; Sayeed, 2014). Managers were broken out as a subgroup in one study of Ideators and Adaptors, yet specific roles were not considered (Sayeed, 2014). Consideration could be given to specific roles and, further, public versus private institutions related to creative problem-solving styles. The

gaps and limitations in the research create opportunities for continued research in the area of methodologies. In order to address convenience sampling, multiple sources for sampling would need to be sought. Populations, other than what is convenient or in some cases more cost effective, should be considered. Remedies to address this limitation would be to seek varied populations, especially beyond higher education.

A little over 93% of the studies followed a quantitative methodology. Extensive data can provide evidence for the investigation and begin to provide explanations and relationships for styles and creative thinking. However, quantitative methodology does not reflect human behaviors and attitudes, a focal point in the area of creativity. Considering the qualitative aspect of a study could capture the social conditions that could add value to these areas of study. One study was conducted using a mixed methodology, and it considered questions for graduate students in addition to quantitative data that was collected (Puccio et al., 2017). It is unclear how the questions were presented to the students. Data were transcribed and reviewed for themes, yet the interaction between the data and the researcher was not visible. There was no indication that the questions changed to adjust to the input of the students.

Organizational settings. Based on this literature review, organizational settings could be a consideration for further research. While a wide variety of settings were considered in the literature, research seemed to be heavily populated by higher education participants, with 50% of the studies coming from this setting**.** To avoid this, in cooperation with convenience sampling, the research consideration should be made for settings beyond a college campus, more specifically, psychology classes or graduate

classes. Having a limited population does not create generalizable findings. Replication studies could be conducted, but the population would need to be considered.

Four studies (Basadur and Basadur, 2011; Basadur et al., 2002; Puccio & Acar, 2015; Sayeed, 2014) came from a cross section of professions for the purpose of seeking out where creative problem-solving styles fall in professions and amidst management. While some studies took place in a single setting, the research across multiple professions and organizational settings was widespread—almost too widespread. An outcome of that situation could be to consider narrowing the investigations of creative problem-solving styles in a few settings. Business and industry were highlighted in the areas of organizational levels. Consideration could be given to levels of management outside of business and industry, or with smaller samples within only private or public settings.

Limited research on divergent thinking attitudes. Only three studies (Basadur et al., 2000; Basadur et al., 2002; Puccio et al., 2017) used the Basadur 14 Point Ideation-Evaluation Preference Scale. While research was found prior to the inclusion dates; it was not considered. There have been minimal comparisons found using the attitudinal survey and individual creative problem-solving styles. The populations used in these studies were South American, management, and graduate students. The limited populations presented a gap in the research in this area. The remaining research that was found on divergent thinking addressed divergent thinking as an aspect needed in a complete creative problem-solving process (Basadur & Basadur, 2011). Six articles were considered (Basadur et al., 2002; Basadur et al., 2000; Clapham et al., 2005; Puccio et al., 2017; Ray & Romano, 2013; Reiter-Palmon & Arreola, 2015) on the topic of divergent thinking within the topic of creative problem solving. Some of the articles conducted

studies to look at divergent thinking as part of the complete creative problem-solving process. Multiple inquiries revealed a limited number of recent investigations of divergent thinking attitudes. In addition, there is scant literature in the references to creative problem-solving styles and the relationship to divergent thinking. Due to this current state, which creates room for increased investigation in these areas.

The research associated with this literature review revealed a number of gaps and limitations. The gaps and limitations were found primarily in three areas: (a) methodology, (b) organizational settings, and (c) limited research on divergent thinking attitudes. A review of the current literature resulted in a number of considerations for future review. The gaps and considerations reflect the methodology, specifically in the area of sampling and aligning sampling to the potential outcomes and generalization of the findings to the population. Recommendations can also be noted in the area of organizational settings and narrowing this area. The current research on creative problem-solving styles reflected over 38 professions and varied levels of management. It would be a recommendation to consider narrowing the field of interest. Last, there is limited research in the areas of creative problem-solving styles and divergent thinking, and these two constructs together.

Limited research in the area of divergent thinking attitudes, coupled with seeking a diverse population beyond psychology or graduate classes in creative studies programs, creates opportunities for research. A study across varied populations, while limiting this sampling (to less than the 38 professions), narrows the field of interest. Future research investigating the question, “What is the relationship between an individual’s expressed

creative problem-solving preferences and divergent thinking attitudes seeking participants in the field" could enhance the research in creative problem solving.

Chapter Summary

This chapter described the current state of the science with respect to creative problem solving, preferences or styles, and divergent thinking, specifically, attitudes in this foundational area. Existing research around creative problem-solving styles highlighted styles that surfaced with more prevalence across various professions (Basadur & Basadur, 2011; Basadur et al., 2014; Sayeed, 2014). When looking at effectiveness as measured by creative outcomes, this could be of interest to organizations in terms of building teams and focusing on goals. This was further developed by studies that addressed creative problem-solving styles throughout levels of management (Basadur & Basadur, 2011; Puccio & Acar, 2015; Sayeed, 2014). Preferences amidst management was found to be high in ideation and implementation (Puccio & Acar, 2015).

A focus on preferences within an organization can support troubleshooting on teams and within hierarchical structures. This idea was further conveyed by Puccio and Grivas (2009) with the focus on the relationship between creative problem-solving preferences and traits. Traits, such as dominance, were seen in Ideators and Implementers. If an Implementer is not in upper management, this trait and preference combination could be perceived negatively, or potentially, challenging. To counter this point, if an individual's CPS preference were known, their thinking style could be maximized to implement solutions. Additionally, the individual could be coupled with an individual with a complementary preference or traits for efficiency and greater creative outcomes. Taking these findings to the level of team performance, it was not surprising to

find results of team performance within a CPS task to be higher for heterogeneous teams (Basadur & Head, 2001). Yet, these teams reported enjoyment in working together as less satisfactory than homogeneous teams or semi-homogeneous teams. Again, a focus on optimization can begin with the identification of creative problem-solving preferences.

While divergent thinking offers breadth to solutions, and it can positively influence outcomes in the CPS process, studies in this area return mixed results. The studies seem to be inconsistent. This may be in part due to some of the measures used and how they were interpreted (Runco & Acar, 2012). This was seen in the studies that were reported in this review. CPS training, with a focus on divergent thinking skills, seemed to impact products or solutions produced and measured by a number of criteria, but they were not limited to: (a) originality, (b) feasibility, (c) quantity, (d) quality, and (e) idea fluency. Yet, in a study by Reiter-Palmon & Arreola (2015), a group producing one-best or most-creative solution outperformed a divergent thinking group that produced many solutions, when judged in the area of quality.

What is known about individual creative problem-solving preferences and divergent thinking attitudes together is narrow. While three studies used the Basadur Ideation-Evaluation Preference Scale (Basadur et al., 2000; Basadur et al., 2002; Puccio et al., 2017), none of them looked at divergent thinking attitudes in relationship to creative problem-solving preferences. From these studies, it is apparent that training can impact the divergent thinking attitudes of individuals. When individuals, management or not, understand the principles of ideation in the creative problem-solving process, he or she is able to ideate or withhold premature evaluation with better success. At a time when many organizations are focused on creative solutions, knowing creative problem-solving

preferences combined with the ability to ideate or come up with a quantity of high-quality novel ideas, might be fruitful.

The current state of the science revealed the continued interest in uncovering the aspects of creativity that relate to creative problem-solving preferences across various professions, organizational levels, implications for team performance, and traits that individuals demonstrate that can support further associations made with creative problem-solving preferences. The literature on divergent thinking revealed a focus on divergent thinking in the creative problem-solving process and divergent thinking attitudes. At their foundations, many of these studies were examining the level of creativity, problem solving, and thinking preferences to predict behaviors of individuals (Kirton, 1994; Puccio, 2002). Additional research can contribute to the field of creative problem solving by further investigating the relationship between creative problem-solving preferences and divergent thinking attitudes. This can support further understanding of the contributions individuals make as creative problem solvers, or not, to unearth the divergent thinking attitudes that various creative problem-solving preferences hold.

Accordingly, and as presented in Chapter 1, this study was designed to examine how each of four creative problem-solving preferences (Puccio, 2002) predict preference for ideation and premature evaluation, two divergent thinking attitudes that support creative thinking (M. Basadur, personal communication, July 28, 2016). Specifically, the study answered the questions:

1. Can the four predictor variables significantly predict the outcome variables?
2. Does each individual predictor significantly contribute to the prediction?

3. How much weight does each predictor carry in predicting outcomes?

Chapter 3: Research Design Methodology

Introduction

When an individual takes part in problem solving, he or she exhibits an individual creative problem-solving preference (Basadur, 2004; Isaksen et al., 2011; Puccio, 2002). Within the stages of creative problem solving (CPS), individuals and teams undergo a process of divergent and convergent thinking, which allows for maximizing creative thoughts (Basadur & Finkbeiner, 1983; Basadur, 1995; Basadur & Hausdorf, 1996; Basadur et al., 2000). Divergence and convergence are defined as foundational modes of thinking for creativity (Basadur et al., 2000). Subsequently, divergence and convergence can be measured. Basadur and Finkbeiner (1983) posited that divergent thinking encompasses two attitudes, preference for ideation and (avoidance of) premature evaluation, needed at each stage of the creative problem-solving process. Looking at one's creative problem-solving style, combined with the attitudes needed for successful divergent thinking, can maximize creative performance and support growth in areas underrepresented by an individual.

A cross-sectional study of four populations (business, non-profit, education, and MBA students) was conducted. Two research instruments were administered concurrently to collect data from the participants: The FourSight Breakthrough Thinking Tool (Puccio, 2002) and the Basadur 14 Item Ideation-Evaluation Preference Scale (Basadur & Finkbeiner, 1985). Additionally, basic demographic information including gender, age range, current role, and educational level were collected.

A cross-sectional analysis, or an observation of a population at one period in time, providing a snapshot, without changing the experiment's environment, was used for this study (Institute for Work & Health, 2015). Cross-sectional analysis supported looking at multiple variables and the relationships between the variables (Singleton & Straits, 2005). Four varied populations were sought for this study to lessen the threat of researcher bias (Huck, 2012; Meyers, Gamst, & Guarino, 2013; Singleton & Straits, 2005). Additionally, historic testing and attrition effects were minimized by conducting a single survey. All measures and procedures used in this study were approved by the Institutional Review Board at St. John Fisher College.

Research Context

This study examined the relationship between an individual's expressed creative problem-solving preference and his or her divergent thinking attitudes. To reduce sampling bias and to increase external validity, individuals from multiple disciplines were sought. To this end, the researcher surveyed working professional participants from business, non-profit, education, and a graduate program, specifically, individuals who held a Master's in Business Administration (MBA). The research context stretched across these four disciplines.

Business. First, at the time of the study, a large human-resource, payroll-management, and benefits business, headquartered in Upstate New York, operated 100 offices nationally. The participants from the headquarters' Information Technology Infrastructure team took part in the survey. Second, a regional office of a large international company, which is focused on industrial products in sealing technologies, was the second business setting for participation, and at the time of the study, the company employed 2,000

employees across 18 global operations. The third, and last, business that participated in this study was a company that serviced national and international clients that were focused on industrial and residential products in the area of pump fabrication and distribution.

Non-profit. In addition to the for-profit business in this study, the survey was administered at a medium sized, non-profit organization located in the Upstate New York area. The focus for the non-profit was real estate, community partnerships, alternative education, and start-up school solutions. At the time of this study, the non-profit employed more than 300 individuals that ranged from human resource and business-related professionals to speech pathologists and private, charter school, and intervention educators.

Education. Participation included individuals from a large suburban district in Upstate New York that, at the time of this research, employed 1,350 individuals, of which approximately 660 were teachers. The district includes six elementary schools, two middle schools, and two high schools. This district educates 8,586 children from diverse backgrounds (Homefacts, n.d.). A second district contributed to the participation in this survey. At the time of this study, the small, rural district was located in Upstate New York and employed 83 teachers. The district consisted of two schools: an elementary school and a secondary school educate, which educated 993 students.

Higher education. A private, liberal arts college, set in Upstate New York was included in this study. At the time of this study, the college was made up of five schools and offered 35 undergraduate programs, 10 graduate programs, and three doctoral programs. Graduate students from the Master's in Business Administration, concentrating in Accounting, General Management, Health Services Management, and the

Pharmaceutical Industry participated. The business programs were accredited by the Association to Advance Collegiate Schools of Business (AACSB International).

Sample

Creative problem solving is multidisciplinary, and it is a universal skill that is needed in many workplaces (Basadur & Basadur, 2011). To increase external validity, the overall sample was heterogeneous in terms of backgrounds, coming from business, non-profit, education, and a graduate-level program. Convenience sampling, a form of nonprobability sampling, which is easily facilitated and reasonably inexpensive, was used to obtain the participants (Creswell, 2014). There should be some caution when using convenience sampling. Convenience sampling, as with nonprobability sampling, can limit generalizing the results from the sample to the population (Huck, 2012). Yet, providing descriptions of the sample, age, years worked, degree level, ethnicity, and other relevant data to define the samples, supports conceptualizing the nature of the abstract population at which the statistical inferences are aimed (Huck, 2012, Singleton & Straits, 2005). It is noted, that according to Singleton and Straits (2005), nonprobability sampling, to which convenience sampling is a form, is appropriate and practical for case selection and is widely used in the social sciences.

Four predictor variables were tested in the analyses. With that number of variables, the a priori power analysis indicated that to have sufficient power to detect a medium effect, a sample of at least 92 participants would be needed (Faul, Erdfelder, Lang, & Buchner, 2007). To decrease sampling error and to ensure sufficient power if the effect is weaker, a sample of at least 200 participants was sought, with an even distribution across the four disciplines (Huck, 2012; Roberts, 2010). Inclusion criteria for

participating in this study were: (a) working professional, (b) holds at least a bachelor's degree to increase homogeneity for three samples with varied backgrounds, and (c) English-speaking (the survey was not translated at the time of the study), and within the three populations of education, business, and an MBA program. Exclusion criteria was: (a) those unwilling to participate, (b) working professionals without a bachelor's degree, and (c) non-English speakers.

Individual characteristics. Data were collected from a sample of 374 individuals from the aforementioned populations. The sample was roughly equal between males (50.7%) and females (49.1%). Of the majority of the participants, approximately three quarters (76.1%) fell in the age range of 26-55 years.

Table 3.1

Individual Characteristics

Variable	%
Gender	
Male	50.7
Female	49.1
Age	
25 and under	9.8
26-40	34.0
41-55	42.1
56 and older	13.9
Background	
Black	1.9
Hispanic	.3
Latino	.3
Multiracial	.3
Asian/Pacific Islander	2.7
White	93.7
Other	.8
Education	
Bachelor's degree	40.6
Master's degree	54.3
Doctoral degree	2.3
Professional degree	.9
Associate degree	2.0

Note. $N = 374$

The vast majority of the sample was White (93.7%). This was a highly-educated sample, with almost 50% holding a master's degree, doctorate, or other advanced degree. Table 3.1 summarizes the individual characteristics.

Organizational characteristics. Organizational characteristics of the sample are found in Table 3.2. The majority of the sample were middle management/administration or trained professionals (84.2%). The participants were in four disciplines and almost even in distribution: business (35%), non-profit (27%), graduate-level students (13%), and K-12 education (23%). The participants were slightly higher in business and lower at the graduate student level.

Survey response rates. The response rate was 100%. The high response rate was likely due to the method of collection. Individuals were given the instrument in already-established, organizational meeting places and times, for example, a department or faculty meeting or scheduled class. Surveys were distributed and collected all at once. Although participation was voluntary, all present in those meetings and classes chose to participate. Efforts were made to keep consistent and equitable distributions of responses across disciplines. However, the number of graduate student responses was lower compared to the others. This was due to the availability of graduate level populations and scheduling.

Instruments Used in Data Collection

Survey instruments were used to measure and quantify the investigations into the human behaviors and creativity, specifically, creative problem-solving preferences and divergent thinking (Creswell, 2014). Two instruments were used in this study to measure individual creative problem-solving preferences and divergent thinking attitudes: the

FourSight Breakthrough Thinking Tool (Puccio, 2002), which was in its 8th version and is a widely used and accepted tool.

Table 3.2

Organizational Characteristics

Variable	%
Role	
Upper/Senior Management	8.3
Middle Management/Administration	31.4
Trained Professional	52.8
Other	7.5
Industry	
Business	35%
Not-for-Profit	27%
Higher Education	13%
K-12 Education	23%

Note. $N = 374$

The Basadur 14 Item Ideation-Evaluation Preference Scale (Basadur & Finkbeiner, 1985) is the only type of instrument found that measures the two divergent thinking attitudes. The two instruments support answering the research question of the study. The researcher was granted permission to use both instruments, which are valid and reliable instruments (Basadur & Finkbeiner, 1985; Puccio, 2002).

The FourSight Breakthrough Thinking Tool is a self-reporting, 36-statement inventory, using a 5-point scale (Puccio, 2002). Individuals report responses on a range from *not like me at all* to *very much like me* (Puccio, 2002). The questions are listed in Appendix B. The scores ranged from 9 to 45, with higher numbers indicating a stronger preference for that particular problem-solving style. Scores are calculated for four preferences: (a) Clarifier, (b) Ideator, (c) Developer, and (d) Implementer. Puccio (2002) investigated the inter-item reliability of the measure and found alpha coefficients for the four subscales ranging from .78 to .81.

The 14 Item Ideation-Evaluation Preference Scale measures divergent thinking attitudes on two subscales: (a) preference for ideation; preference for generating ideas; and (b) preference for evaluation; premature judgment and evaluation (Basadur & Finkbeiner, 1985). A 9-point Likert scale ranging from *strongly disagree* (1) to *strongly agree* (9) was used. Six items reflect preference for ideation. For this subscale, higher scores reflect a preference for the generation of ideas. Eight items reflect premature critical evaluation. Items are listed in Appendix C. For this subscale, the higher an individual's score, the less an individual is open to ideation and shows more premature critical evaluation of ideas. Inter-item reliability for these subscales ranges from Cronbach's alphas of .68 to .83 (Basadur et al., 2002).

The two instruments were combined to create one survey that was printed and given to the participants. A paper and pencil task ensured a better response rate, which was administered and collected in the same setting and location. The surveys contained demographic information, questions from the FourSight Breakthrough Thinking Tool (Puccio, 2002), and the Basadur 14 Item Ideation-Evaluation Preference Scale (Basadur & Finkbeiner, 1985.

Data Collection

To begin the data collection process, the researcher met with personnel in each organization to explain and agree upon timelines, distribution, informed consent, and collection of the surveys (Roberts, 2010). Personal contact was made via a letter, as a formal way to introduce the researcher and the study, which was used to support increased data collection rates (Roberts, 2010). The following steps were taken to increase the participation rates and decrease threats to the internal validity of the results.

First, the researcher developed a clearly written and simple cover page detailing the legitimacy of the study, benefits of contributing to the field of creativity and creative problem solving, a brief overview of the topic, and confidentiality (Joyner et al., 2013). An informed consent form was included and detached from the survey at the time of completion to maintain anonymity of the participants. Second, the two instruments were collated with the cover page and simple, clear directions, as a paper and pencil task, and they were distributed. The instruments took approximately 15 minutes to complete. Third, a brief introductory synopsis of the study was conducted with each group prior to collecting the data.

Summary

The research methodology guided the examination of this study to answer the question, "What is the potential relationship between an individual's expressed creative problem-solving preferences and divergent thinking attitudes? As creative problem solving continues to be a focus across disciplines, and as it gains continual focus, this study was deemed relevant and will contribute to the body of knowledge with respect to the relationship between the variables. The results may be used to inform organizations interested in looking deeper at personnel, as creative and innovative contributors.

This study surveyed 374 participants and focused on four problem-solving style preferences (Clarifier, Ideator, Developer, and Implementer) and two preferences related to divergent thinking (Ideation and Evaluation), utilizing multiple linear regression for the data analysis. This is widely accepted as an appropriate approach to analyze data when the relationship between two or more explanatory variables and a response variable are being considered.

Chapter 4 reports the results of the multiple linear regression analysis conducted on the resulting data to understand the relationship between problem-solving styles and divergent thinking.

Chapter 4: Results

Introduction

The purpose of this study was to examine the relationships between an individual's expressed creative problem-solving preferences and divergent thinking attitudes, as creativity and innovation continue to gain momentum as desirable attributes across many disciplines for individuals, leaders, and teams (Puccio et al., 2011; Ray & Romano, 2013; Vickberg & Christfort, 2017). Empirical research points to the benefits of having a better understanding of individual's divergent thinking attitudes, to support creative thinking and outcomes (Basadur & Basadur, 2011; Basadur et al., 2013). This study will aid in furthering understanding the relationship between the two variables. A multiple linear regression was used to answer the research questions:

1. Can the four predictor variables significantly predict the outcome variables?
2. Does each individual predictor significantly contribute to the prediction?
3. How much weight does each predictor carry in predicting outcomes?

This chapter has three main sections. First, the data analysis and findings of the study are presented. The research questions of the study are then addressed, and the chapter concludes with a summary of the results.

Data Analysis and Findings

The data analysis was conducted in four phases. First, the data were prepared and screened to ensure they met the assumptions of a normal distribution. Second, the scores for each subscale were examined to provide an orientation to the distribution of the

problem-solving preferences and divergent thinking attitudes. Third, the correlations among these variables were examined. Fourth, based on the findings of those correlations, a multiple linear regression was used to test whether the four problem-solving preferences predict the two divergent thinking attitudes. All data analysis was conducted using the Statistical Package for Social Sciences (SPSS) database (Version 23; IBM, 2015).

Data preparation. To prepare for the analysis, the data were entered into IBM SPSS. Once the data were entered into SPSS, the database was screened and cleaned by running frequencies to identify and correct any invalid entries. Additionally, the mean scores for predictor variables, Clarifier, Ideator, Developer, and Implementer and two divergent thinking attitudes, preference for ideation and premature evaluation, were calculated. The scaled scores were created by reverse coding, with the necessary items on the FourSight Breakthrough Thinking Tool (Puccio, 2002). The summed scores were calculated for each of the FourSight subscales, Clarifier, Ideator, Developer, and Implementer. For discussion purposes, the participants are regarded as Clarifiers, Ideators, Developers, and Implementers. These are the scores and not the personality types.

Scale normality. Each of the major variables, four preferences within the FourSight Breakthrough Thinking Tool, and two attitudes measured by the Basadur 14 Point Ideation-Evaluation Preference Scale were examined to ensure they did not violate any assumptions of a normal distribution. Because multiple linear regression assumes normal distribution of the outcome variables, preferences and attitudes were screened for distribution and found to be within acceptable limits of normal distribution. Histograms

were analyzed and revealed a normal curve for each of the variables. Table 4.1 provides a summary of the skew and kurtosis.

Table 4.1

Scale Normality

Variables	Skewness	Kurtosis
Clarifier	–.134 (*SE* = .128)	–.199 (*SE* = .254)
Ideator	–.025 (*SE* = .128)	–.594 (*SE* = .255)
Developer	–.196 (*SE* = .128)	.256 (*SE* = .255)
Implementer	–.210 (*SE* = .128)	.116 (*SE* = .256)
Preference for Ideation	–.233 (*SE* = .127)	.031 (*SE* = .254)
Premature Evaluation	–.396 (*SE* = .127)	–.085 (*SE* = .254)

Descriptive statistics. To provide a general sense of how people scored, descriptive statistics of the two instruments are presented in Table 4.2. The mean scores for FourSight were very similar (*M* range = 31.71-33.86). Standard deviations showed similar variability (*SD* range = 4.71-5.34). It should be noted that preference for ideation and premature evaluation have different possible ranges due to different numbers of questions in each subscale. For both subscales, the means were slightly above their midpoints. There was greater variability in the scores for premature evaluation (*SD* = 11.03) than in the scores for preference for ideation (*SD* = 6.96).

Table 4.2

Descriptive Statistics

Scale	Min	Max	*M*	*SD*
FourSight				
Clarifier[a]	20.00	45.00	33.38	4.71
Ideator[a]	18.00	45.00	31.72	5.28
Developer[a]	11.00	45.00	32.12	5.34
Implementer[a]	19.00	45.00	33.86	4.92
The Basadur 14 Item Ideation-Evaluation Preference Scale				
Preference for Ideation[b]	15.00	54.00	35.45	6.96
Premature Evaluation[c]	16.00	70.00	45.97	11.03

Note. When interpreting scores, comparisons must take into account that the scales had different possible ranges: [a]Possible range of scale = 9-45, [b]Possible range of scale = 6-54, and [c]Possible range of scale = 8-72

Correlations. Prior to conducting the multiple linear regression, bivariate correlations were calculated on the major variables. This was done to verify that at least most of the predictor variables were correlated with the outcomes variables and that no predictor variables were too highly correlated with one another (Huck, 2012). As shown in Table 4.3, there was a statistically significant correlation among all four FourSight subscales. However, these correlations were low enough that they can be considered independent of one another. All four subscales were also correlated with a Preference for ideation, indicating that they could reasonably be used as predictors of preference for ideation in a regression analysis. Only one of the FourSight subscales (Ideator) was

significantly correlated with premature evaluation. However, to keep the analyses consistent, a regression was run on these variables, as well, knowing there was a smaller chance they would significantly predict that outcome.

Table 4.3

Correlations of the Variables of the Analysis

Variable	1	2	3	4	5	6
Clarifier						
Ideator	.46*					
Developer	.76*	.52*				
Implementer	.34*	.46*	.36*			
Preference for Ideation	.17*	.23*	.19*	.20*		
Premature Evaluation	–.02	–.18*	–.03	–.09	–.23*	

Note. $N = 374$; *$p < .01$

Multiple linear regression analysis. Two multiple linear regressions were run to test whether the four predictor variables (Clarifier, Ideator, Developer, and Implementer) could predict the outcomes of the preference for ideation and the tendency toward premature evaluation. However, because of the theory being tested, all variables were included in the regression. The regression analysis showed the preference for ideation was predicted by the full model, F (4, 330) = 6.52, $p = .000$, $Adj.R^2 = .06$ (Table 4.4). However, the effect size was low. Looking at the predictor variables individually, only the Ideator and Implementer scores were significant predictors of preference for ideation (Ideator, $t = 2.04$, $p < .05$; Implementer, $t = 2.34$, $p < .05$). The participants who endorsed Ideator and Implementer preferences more strongly endorsed a preference for ideation. In other words, those with higher scores for Ideator and Implementer had higher scores, showing a preference for ideation. Those with higher scores for Clarifier and Developer

preferences did not show significant relationships for the prediction of the attitude, preference for ideation. The betas from the regression model were used to determine the relative weights for each factor. The results indicate that the weights for the Ideator and Implementer scores were marginally different (Ideator, β = .136; Implementer, β = .141).

Table 4.4

Regression Analysis Preference for Ideation

Predictors	B	Standard Error	ß	*t*	*P*
Clarifier	.02	.12	.01	.17	.86
Ideator	.18	.09	.14	2.05	.04
Developer	.06	.11	.05	.52	.60
Implementer	.20	.08	.14	2.34	.02

Note. Model: F (4, 330) = 6.52, p = .000, Adj. R^2 = .06

The regression analysis showed the tendency toward premature evaluation was predicted by the full model, F (4, 329) = 3.46, p = .009, Adj.R^2 = .03, (Table 4.5). The effect size was low. However, only those with high Ideator scores were significant predictors of the tendency (t = -3.24, p = .001). The participants who endorsed Ideator preferences were less likely to endorse a tendency toward premature evaluation. This divergent thinking attitude is one to avoid, because premature evaluation is not favorable. The higher the score, the higher the tendency to prematurely evaluate an idea. Individuals with high Clarifier, Developer, and Implementer scores did not show a significant relationship toward premature evaluation. This may imply that they tend to prematurely evaluate, unlike an Ideator, who is more accepting of new and novel ideas. These results

are consistent with the bivariate correlations that indicated only Ideator scores were significantly correlated with premature evaluation.

Table 4.5

Regression Analysis Premature Evaluation

Predictors	B	Standard Error	ß	T	*P*
Clarifier	–.06	.19	–.03	–.31	.760
Ideator	–.45	.14	–.22	–3.24	.001
Developer	.26	.18	.13	1.45	.150
Implementer	–.07	.13	–.03	–.50	.610

Note. Model: F (4, 329) = 3.46, p = .009, Adj. R^2 = .03

Summary of Results

This chapter reported the findings of the study that examined the potential relationship between an individual's expressed creative problem-solving preference and divergent thinking attitudes. Accordingly, the relationships were tested using two multiple linear regression analyses. Multiple linear regression was used to determine:

1. The overall regression equation using creativity preferences as predictors significantly predicts two divergent thinking attitudes and how much of the variance is accounted for;
2. If each creativity preference significantly contributes to the prediction; and
3. Which creativity preferences carry more weight in the prediction.

The results of the analyses demonstrated that the preference for ideation was predicted by the full model, F (4, 300) = 6.52, p = .000, $Adj.R^2$ = .06, as was true for preference for evaluation, F (4, 329) = 3.46, p = .009, $Adj.R^2$ = .03. The regression

equation was statistically significant for preference for ideation with individuals who had high Ideator and Implementer scores, significantly contributing to the prediction. A separate regression analysis on preference for premature evaluation found that, although the regression equation was statistically significant, only those with high Ideator scores contributed to the prediction of preference for premature evaluation. The relationship was such that Ideators were less likely to endorse a tendency for premature evaluation.

In summary, the results of this study demonstrate that of the four creative problem-solving preferences, two of them, Ideators and Implementers, significantly contribute to the prediction of preference for ideation; while only one preference, Ideators, contributes to the prediction for being less likely to have a tendency toward premature evaluation. The betas from the regression model were used to determine the relative weights of each factor. The results indicate that the weights for Ideator and Implementers were marginally different (β = .136 and β = .141, respectively). The implications of these findings and recommendations for future research are discussed in Chapter 5.

Chapter 5: Discussion

Introduction

This study examined creative problem-solving preferences: Clarifier, Ideator, Developer, and Implementer, and the significant relationship with two divergent thinking attitudes, preference for ideation and premature evaluation (Basadur & Finkbeiner, 1985; Puccio, 2002). The results of the multiple linear regression indicate that there is a significant relationship between those with high scores for Ideators and Implementers and a preference for ideation, while only Ideators showed a relationship with premature evaluation, keeping in mind that this is a tendency to be less likely to evaluate prematurely.

This chapter discusses the results of this study and the findings relating to the research question: "What is the relationship between an individual's expressed creative problem-solving preferences and divergent thinking attitudes?" Beyond the introduction section, this chapter includes the: Implications of the Findings, Recommendations, Strengths and Limitations, and Conclusion.

Implications of Findings

Based on the study's findings, this section presents the implications pertaining to four creative problem-solving preferences: Clarifier, Ideator, Developer, and Implementer, and the relationship to two divergent thinking attitudes, preference for ideation and a tendency for premature evaluation. The divergent thinking attitudes add

another cognitive dimension to the discussion in creative problem solving that individuals and teams face in a global landscape today.

The results of this study uncovered three significant relationships between creative problem-solving preferences and divergent thinking attitudes out of eight potential relationships. The study identified significant positive relationships between the participants who identified as Ideators and Implementers, and they had a preference for ideation, or to generate or explore ideas. Additionally, the study found that individuals who identified as Ideators, or those who enjoyed generating and exploring many ideas, were less likely to prematurely evaluate ideas. The overall finding for those who identified as Ideators, having significant relationships with both divergent thinking attitudes and being the only identified preference aligned to the two attitudes is notable, and will be discussed. Those with high scores as Clarifiers and Developers did not show any significant relationships with the two divergent thinking attitudes.

The relationship between Ideators and the preference for ideation is not surprising. Ideators tend to be energetic, generative in his or her thoughts, and enjoy the playing of ideas (Puccio, 2002). Consideration to this finding and the role of an Ideator can support confidence that options and new ideas will be explored. Ideators contribute through expanded thinking and novel idea generation. The lack of this role in an organization or team can lead to unexplored ideas, or leaving behind the ability to generate new and novel thinking, leading to the reuse of previous ideas or solutions.

The Implementer relationship to preference for ideation was an interesting outcome, and it was unexpected. Typically, Implementers tend to be impatient and eager to move ideas forward or move to action. Implementers may resist generating more ideas.

However, an Implementer with a preference for ideation could be beneficial because he or she may be able to generate new ways to accelerate an idea to action. Taking a deeper look, and according to the FourSight Breakthrough Thinking Tool, individuals can display preferences in more than one stage of the creative problem-solving process (Puccio, 2002). For the purposes of this study, only high scores for each of the four main preferences were considered. The relationship of those identifying as Implementers and with a preference for ideation might be explained by an individual potentially having dual preferences for creative problem solving. An Implementer could show a high preference for being an Ideator, as well. According to the FourSight Breakthrough Thinking Tool, this individual would be considered a Driver (Puccio, 2002). These findings seem to corroborate the results of Puccio and Acar (2015). The results showed a relationship between senior leaders and their abilities and willingness to not only think big and ideate but to define the pathway to achieve the outcome.

The results of this study also showed Ideators as being less likely to prematurely evaluate ideas, aligning to the Ideator's preference. This relationship supports the general perception of Ideators, individuals who suspend or hold off his or her evaluation of ideas. Ideators tend to be more open-minded than other creative problem-solving preferences. This could create a critical role for Ideators as key players and contributors to a team or organization. An Ideator finds novelty and originality useful. He or she may have the abilities to not discard ideas but to consider ideas and solutions with and for new value. If a team does not include an Ideator, individual contributors and groups could be quick to find common solutions, returning to what is common or known. Individuals or teams without an Ideator role may be quick to dismiss new and novel ideas, which would be

due to the tendency toward premature evaluation. The current literature supports this being overcome through training. Training can focus on supporting idea generation with the explicit teaching of tools. Individuals also benefit from exercises to increase abilities in these areas (Basadur et al., 2000; Basadur et al., 2002; Puccio et al., 2017).

No significant relationships were found among high scores in Clarifiers, Developers, and Implementers and prematurely evaluating ideas. While insignificant relationships are not a focus, this is a notable outcome when considering individual contributions in the workplace or to team outcomes. Each of these preferences might be quicker to judge or evaluate ideas prematurely. This makes reasonable sense, as Clarifiers tend to seek out details and proceed more cautiously, Developers prefer to refine the plan and analyze to improve, and Implementers move to action quickly (Puccio, 2002). Due to the nature of these three preferences, each may dismiss new ideas due to energies for other aspects of the creative process.

Preferences, within the FourSight model and others, are representative of a full creative problem-solving cycle. If an individual who identified a preference and is working independently, achieving creative outcomes in a non-preferred area may pose as a challenge, compounded by lack of divergent thinking attitudes. Each step in the process for creative problem-solving benefits from active ideation and thoughtful convergence or from the ability to evaluate and choose from options (Basadur et al., 2000). This increases the likelihood of uncovering new and useful insights in the service of producing a creative solution. This study brings to light a potential deficiency or lack of active divergence and thoughtful evaluation within the clarifier and developer steps of the creative problem-solving process. This limitation may lead to disappointing results for

individuals and teams striving for creative solutions. In other words, individuals who identify as Clarifiers, those who prefer details, understand the challenge and explore the data, did not show a preference for ideation. This means that Clarifiers might have a lower tendency for generating and exploring many ideas. This is an important consideration because it can present the risk of leading to working on the wrong problem (Basadur & Hausdorf, 1996). A similar finding resulted for the Developers, and this can also lead to lack of iteration of ideas or solutions.

These findings are in alignment with the findings of Puccio et al. (2004), who uncovered, when looking at preference and an individual's enjoyment of tools aligned to his or her preference type. For example, Clarifiers preferred learning more about the gathering data stage of the creative problem stages (Puccio et al., 2004). Clarifiers desired to develop the ability to show a preference for ideation. Puccio et al. (2004) reported this finding may reflect a tendency for Clarifiers to have a preference toward analysis and convergent thinking, or evaluation. All the skills and attitudes exhibited by each preference need to be present in a team to reach optimal creative results (Basadur & Finkbeiner, 1983, 1985; Puccio, 2002). When searching for new insights and creative solutions, a team of Clarifiers would benefit from the presence of an Ideator. This is supported by an Ideator's tendency to value ideation and avoid premature evaluation or judgment.

Strengths and Limitations

This study was conducted with 374 participants, drawing from four populations: business, non-profit, K-12 education, and graduate students. This cross-section was a strength and provided a bit more depth to the data, rather than if the data were collected

from one population. It also increased the external validity of the study. Additionally, the multi-disciplinary study facilitated the examination of data from individuals with varied backgrounds. The multidisciplinary sample of this study contrasted with the multitude of studies, as described in Chapter 2, which were drawn from solely graduate students or business. Therefore, this study extended the body of literature with respect to creative problem-solving preferences and divergent thinking attitudes.

The two instruments used in this study were also a relative strength, as the literature supported in Chapter 2. These two instruments had not been used together to look at creative problem solving and divergent thinking attitudes. This study provides insight about the four creative problem-solving preferences as defined by the FourSight Breakthrough Thinking Tool (Puccio, 2002) and the two divergent thinking attitudes noted in the Basadur 14 Item Ideation-Evaluation Preference Scale (Basadur & Finkbeiner, 1985).

A multiple linear regressions analysis of the four creative problem-solving preferences and the two divergent thinking attitudes presented relationships that strengthen the understanding of an individual's preference within the FourSight theory for creative problem solving and an individual's tendency toward ideation or evaluation. While self-reported, the data was collected in controlled environments, without any known exposure to the topics of creative problem solving. This is in contrast to a number of studies, described in Chapter 2, in which the participants often received some training and then answered the surveys about creative problem solving.

A limitation to this study was the nature of the cross-sectional analysis, in one period of time, providing a snapshot of the data. Cross-sectional analyses are useful in

assessing attitudes, knowledge, and beliefs in a population at a specific time (Huck, 2012). The nature of this study allowed for examining multiple factors and outcomes in one single study. However, it was limited in its ability to provide definite information about causal relationships. An important consideration here is that creative problem-solving preferences do not change over time. However, divergent thinking attitudes can be changed, increased or decreased, with the effects of training. Longitudinal or qualitative data could begin to determine the cause and effect relationships or impact of training over time.

The research in the field of creative problem-solving preferences and styles seems to be heavily weighted in surveys. Future research designs may benefit from the inclusion of a qualitative approach to understand individuals' creative problem-solving preferences and divergent thinking attitudes. A qualitative design would allow for a deeper look at individuals' beliefs, feelings, and attitudes. If used alongside quantitative data, it could support why individuals identify with a preference or attitude. Qualitative data collection would allow individuals to respond and potentially open up new ideas that have not been considered before.

Recommendations

Based on this study's findings, this section provides recommendations for future research. While the findings in this study reveal relationships between creative problem-solving preferences and divergent thinking attitudes, these results were limited to the two areas of preferences and tendency for ideation and evaluation. Substantive and methodological recommendations are presented, followed by recommendations for practice.

Substantive recommendations. There are two substantive recommendations for future consideration. Many divergent thinking studies with groups had teams creating a product or completing a task to be judged for novelty, originality, or quality/quantity of ideas. This study was conducted at the foundational level with individuals. Further research could consider analyzing the FourSight preferences and divergent thinking attitudes of teams. Team profiles could be produced using both FourSight preferences and divergent thinking attitudes. The composition of the team profile could then be analyzed at the performance level, using such variables as efficiency, communication, or collaboration and outcomes. Teams may discount Ideators and Implementers who show a preference for ideation and share new and novel ideas in a team that does not have a tendency toward this attitude. Ideators are solo when it comes to not prematurely evaluating ideas. On a team, this may cause conflict, as Ideators also prefer to play with ideas, something that may put others out of his or her comfort zone. Varieties of teams could benefit from developing an understanding of the construction of the group and the preferences for the creative problem solving it exhibits. These outcomes could support prescriptive training to grow teams in gap areas, leading to increased communication, empathy, and to improve creative and innovative outcomes.

A second recommendation for future research would be to more deeply explore the relationships for Clarifiers and Developers and the two divergent thinking attitudes. This study did not show any attitudinal preferences, which can pose a problem for Clarifiers and Developers in ideation. However, there is value in generating and considering novel options by all preference types, in all stages. when engaged in creative problem solving (Basadur, 2004; Isaksen et al., 2011; Puccio, 2002). Each individual can

be successfully equipped to contribute to each stage of the CPS process without being dependent upon another preference, keeping in mind these are preferences and not abilities. If two of the four creative problem-solving preference types potentially lack the two attitudes supporting active divergence, this creates a notable gap. This could negatively impact Clarifiers and Developers who are independently engaged in creative problem solving. This could also potentially hold true for teams to which these two preferences contribute. As noted previously, this can be done with targeted training and potential coaching for a more purposeful composition of teams. New research could highlight specific gaps in the individuals' processes and help target methods to close those gaps to increase the potential for creative solutions.

Methodological recommendations. Future studies could attend to three methodological recommendations. First, future studies could utilize additional qualitative measures that reveal more in-depth information about individual participants. For example, interview strategy could be developed to reveal beliefs, behaviors, and attitudes of an individual identifying through a high score as a Clarifier, Ideator, Developer, or Implementer. The results of those studies could inform the lived experience of an individual's creative problem-solving preferences and divergent thinking attitudes (Creswell, 2014). Comparing quantitative and qualitative studies would be informative. The resulting data could be analyzed and compared to inform whether the data confirms this study's findings or contradicts them. Qualitative studies could provide more detail and personal insight from individuals who identify as Clarifiers, Ideators, Developers, and Implementers and who have divergent thinking attitudes. For example, an individual could be asked about his or her own practices while working in isolation and the

perceived obstacles to creative problem solving. In turn, individuals could also be asked about the performance of preferences outside of his or her own. These studies might provide rich information and data that might not otherwise be exposed through the more regimented data collection of quantitative studies.

In consideration of the lower effect size of the results in this study, there seem to be other variables that contribute to the relationship of creative problem-solving preferences and divergent thinking attitudes. Hence, the obtained results should be reviewed carefully. The effect size indicates that a small amount of the variability of the outcome is accounted for by the predictor variables (Urdan, 2010). Some variables that could potentially be good predictors may not be identified in this literature review, measuring others may have demanded too many resources, and still others may have not been amenable to the measurement instrumentation used in this study.

Additionally, consideration could be given to gender and creative problem-solving preferences and divergent thinking attitudes. Many studies collect demographic data with little use of it in the findings. There may be gender differences that contribute to areas of creative problem solving. This could also impact how teams are constructed, what roles men and women play in creative problem solving, and the relationships of men's' and women's tendency toward ideation or evaluation. Would the findings be similar or varied between men and women? This could support developments in staffing, training, and teaching strategies to men and women.

Finally, consideration could be given to seeking out a more diverse sample. Recent attention has been given to diversity of thought. This can lead to creative diversity, based on the varied backgrounds of the individuals sampled. The sample in this

study was predominantly Caucasian and the numbers were evenly distributed between male and female. Future studies could focus on the output of males and females and seek a more diverse sample. From this, there could be a focus on demographics within the sample and potential differences each contributes to CPS, measured by preferences and the populations' divergent thinking attitudes.

Recommendations for improved practice. Based on the findings of this study, recommendations can be made for the work place for individuals and teams, as they work toward creative solutions: (a) with strategy, (b) with management, (c) through the hiring process, (d) with individuals and team composition, and (e) in decision making. These recommendations are in consideration of the lower effect size of this study. As practitioners consider recommendations, each individual, manager, or team should adjust for his or her own situation.

Strategy. As individuals or teams are pressed with streamlining strategy, which is due to changes in technology, the onset of global and virtual teams understanding an individual or team's cognitive composition can support strategy development. The study's findings show a significant relationship between high score Ideators, those who prefer to consider many ideas, and high score Implementers, those who prefer to move to action, and a preference for ideation. This preference can impact the idea generation for an individual or team. Clarifiers, those who can be seen as cautious, careful, and factual and Developers, those who prefer to analyze and refine ideas, might be more adverse to ideation. If individuals and teams consider their own preference, those respective teams could be staffed more appropriately, leading to augmenting the team when a preference is low. Adding strategies to help team members to become not only aware, but to have tools

to use in ideation, could be beneficial. Using preferences enhanced by the knowledge of divergent thinking attitudes can lead to improved collaboration as teams develop strategic plans.

Management. As Puccio and Acar (2015) found, upper-level to senior management tend to be Implementers, those who prefer to move to action, or Implementers and Ideators together. This is not surprising when thinking about senior-level management tending to move to accomplishments, deadlines, timelines, and action. This study offers additional guidance and attention to the mix of individual preferences on, for example, a leadership team. This can ensure that data can be gathered, ideas can be generated, plans and strategies can be developed, and those plans will be implemented sufficiently. Assuring Ideator and Implementer preferences are on a team might increase the potential for creativity, as these individuals show a tendency toward divergent thinking through a preference for ideation. There is a benefit to teams, at all levels of an organization, to know and understand creative problem-solving preferences and attitudes tendency toward divergent thinking. This can build an understanding of the personnel a team works with and for and how to maximize this knowledge for results and to maximize efficiency.

Hiring process. The results of this study support an essential element of team creativity (Basadur & Head, 2001). Creatively diverse groups of individuals can drive innovation and build collaboration (Ray & Romano, 2013). The converse of this can occur too. Frustration can emerge when individuals have varied creative preferences and attitudes. Maximizing an individual's natural tendency can improve engagement through empathy and communication. In the hiring process, the tools used in this study could be

administered to consider an individual's alignment with a job description or team composition. This is becoming a wider spread practice for entities to move toward understanding the cognition of personnel within an organization and with the use assessments (Harrell, 2017). This can potentially lead to a better understanding of the traits that lead to high-performing teams and organizations.

Team composition. Individuals compose teams. As teams come together to innovate in the pace of this global economy, cognitive diversity can benefit organizations (Puccio et al., 2011). This study can support the underlying foundation and success of teams and individuals. Teamwork and the ability to have informed conversations about preferences, how individuals prefer to be treated, appreciated, and contribute, can lead to increased openness and collaboration. These findings can also help ensure fundamental attitudes are present in a team, and that they possess a mix of individual preferences needed to amplify the creative process. Basadur (2004) and Puccio (2002) recognized the need for each preference and divergent thinking attitudes to facilitate progress in finding and executing innovative solutions. In the potential absence of these components for creative problem solving, training has shown to be an effective way to increase individual and team outcomes, increasing a tendency for divergent thinking attitudes (Basadur et al., 2000).

Decision making. According to the creative problem-solving process, individuals operate in all stages of creative problem solving, clarifying, ideating, developing, and implementing (Puccio, 2002). Given the outcomes of this study, individuals or groups without, for example, Ideators, may be impacted in their ability to generate a volume of new ideas. Without the capacity of divergent thinking attitudes, a team might make hasty

decisions and lack innovative goal options. The results of this study can catalyze thinking for individuals in making creative decisions and equipping individuals and teams with a common language to use.

Conclusion

There is a thrust behind this research. Creativity and creative problem solving have been listed as some of the most coveted skills, equipping individuals, leaders, and organizations with the skillset to remain competitive and survive (IBM, 2010). Recalling Chapter 1, individuals who show a propensity for creative problem solving and the ability to diverge in his or her own thinking are more likely to be a part of creative accomplishments. While much energy and efforts go into creative solutions, an inside view into the cognition of an individual may increase the likelihood of a creative outcome.

This study examined the potential relationship between an individual's expressed creative problem-solving preferences and divergent thinking attitudes. The results indicate two significant relationships between Ideators and Implementers and a preference for ideation. A significant relationship was found with Ideators and premature evaluation, showing a tendency to avoid it. The implication to draw from these results is that individuals vary in their divergent thinking attitudes. The identification of an individual's preferences for creative problem solving and divergent thinking attitudes can support forming and shaping decisions that individuals and leaders make in an effort to generate creative solutions. These outcomes are another piece of evidence supporting the importance of identifying the cognitive foundations of individuals and preferences. The

attitudes can be influenced by training and exposure to strategies and tools (Basadur et al., 2000).

This study resulted in recommendations for practice for strategy development, management, hiring process, team composition, and decision making. Ultimately, this study can provide guidance for organizations looking for optimal creative results and outcomes. Organizations, using tools, can have informed discussions about preferences and divergent thinking attitudes. This dialogue can be further guided by a common language each of these tools can provide. Goals can be set, and the skill sets of individuals can be optimized.

There were strengths and limitations of this study. This study was a snapshot of a much larger landscape in creative research. Qualitative studies and those that include minorities could be considered to further understand these results, providing a different lens for outcomes.

In summary, this research added to the body of knowledge by introducing a study focused on creative problem-solving preferences and divergent thinking attitudes. There were significant relationships as outcomes of this study demonstrated in the relationship between four creative problem-solving preferences and two divergent thinking attitudes. Although the effect size was low, it continued the discussion in the area of focusing on cognition within organizations, which seems to be a growing trend. This trend allows organizations to identify traits in the workforce and better align teaming and outcomes to individuals' and teams' strengths and needs (Harrell, 2017). As companies focus on gaining the competitive edge through the newest and most novel outcomes, it behooves them to acknowledge the creative forces within their organization's human capital.

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Appendix A

Summary of the Literature

Subject	Study	Sample	Measure	Finding
Creative problem-solving styles across professions	Basadur & Basadur (2011)	3942 adults 38 different occupations 39% female, 61% male	CPSP	Low-level generators in business/industry
	Sayeed (2014)	417 Indian professionals Avg. age 32.5 40% female, 60% male	KAI	Low innovators in population
	Basadur, Gelade, & Basadur (2014)	6091 CPSP questionnaires, full time, or MBA students 3783 into four categories Non-management to upper management	CPSP	High level of Generators in arts, education; question about Generators needed at other levels
Creative problem-solving styles and traits	Puccio & Chimento (2001)	113 laypeople 66 male, 47 female 75 undergrads 27 male, 48 female	KAI for student population	Innovators identified Innovators as more creative, as did untrained population, no difference b/t styles with Adaptors
	Kwang et al. (2005)	243 Singapore university students 82 male, 161 female 195 Australian university students 62 male, 131 female	KAI and Schwartz Value Inventory	Participants were significantly correlated with certain traits for Adaptors and Innovators
	Puccio & Grivas (2009)	137 leadership; hospital 41 male, 96 female	FourSight and DiSC	7/16 correlation coefficients statistically significant Found in 4 FourSight scales and 4 DiSC scales
Creative problem-solving styles & organizational levels	Basadur, Gelade, & Basadur (2014)	6091 CPSP questionnaires Full time or MBA students 3783 into 4 categories Non-management to upper management	CPSP	Higher levels of Conceptualizers and Implementers in upper management

Subject	Study	Sample	Measure	Finding
	Sayeed (2014)	417 Indian professionals Avg. age 32.5 60% male, 40% female	KAI	Low innovators in population Near innovators scores in entrepreneurs
	Puccio & Acar (2015)	7280 participants 3697 male, 3501 female Public and private sectors	FourSight	Highest levels of management reflect Ideators and Implementers
Creative problem-solving styles and team performance	Ray & Romano (2013)	250 undergraduate students enrolled in business courses Avg. age 27.8 46.71% male, 53.29% female	CPSP* *styles merged into two groups	Ideators (Conceptualizers and Generators) had higher scored significantly better on idea generation phases
	Basadur & Head (2001)	196 MBA students 49 4-member teams	CPSP, independent judges	Heterogeneous groups did significantly better on task than homo and semi-homo groups. Yet, team satisfaction was higher for homo and semi-homo
	Puccio, Wheeler, & Cassandro (2004)	84 students 73 graduate 11 undergraduates 25 male, 44 female	FourSight and Kirkpatrick's Model for Evaluating Training	Significant relationships found for students using various components of CPS, preference for stages, principles, and tools. Relationships between FourSight styles and various CPS components, stages, principles, and tools
Divergent thinking	Basadur, Runco, & Vega (2000)	112 lower through upper managers Large multi-national consumer-goods manufacturer	CPSP; Basadur's 14 Point Ideation-Evaluation Preference	Significant relationships between ideational skills and quantity and quality of ideas and trained group; also significance b/t original idea production and trained group
	Basadur, Pringle, & Kirkland (2002)	149 South American managers and professionals from business, industry, and government	Basadur's 14 Point Ideation-Evaluation Preference	Managers trained in Simplex scored higher on post test for divergent thinking attitudes
	Clapham, Cowdery, King, & Montang (2005)	30/57 engineering students Midwestern university 51 male, 49 female	Owens's Creativity Tests & Structure of Intelligence Learning Abilities Test: Evaluation, Leadership & Creative Thinking (SOI ELCT	Positive significant relationships between Owens's Applications subtest and creative work activities ($p < .05$) and patents
	Puccio, Keller-Mathers, Acar, & Cayirdag (2017)	60 graduate level students in Master's degree or graduate certificate program 22 male, 38 female	Basadur's 14 Point Ideation-Evaluation Preference	Students scored significantly higher in divergent thinking attitudes after training* in creativity * training was coursework

Subject	Study	Sample	Measure	Finding
	Ray & Romano (2013)	250 undergraduate students enrolled in business courses Avg. age 27.8 46.71% male, 53.29% female	CPSP*, Independent judges *styles merged into 2 groups	Ideators scores significantly higher in divergent phase of creative problem solving
	Reiter-Palmon & Arreola (2015)	187 college students 29% male, 71% female 22.3% freshmen 24.5% sophomores 19.7% juniors 25.5% seniors	Independent judges	Divergent thinking participants produced on average more ideas and the highest rated original idea; group producing just one best or most creative solution significantly outperformed the divergent task group, in average quality and highest rated quality

Appendix B

Items from FourSight Breakthrough Thinking Tool (Version 8)

1	I like testing and revising my ideas before coming up with the final solution or problem.
2	I like taking the time to clarify the exact nature of the problem.
3	I am naturally inclined to take action
4	I like to break a broad problem apart and examine it from all angles.
5	I see connections others don't
6	I like identifying the most relevant facts pertaining to a problem
7	I don't have the temperament to sit back and isolate the specific causes of a problem.
8	I enjoy coming up with unique ways of looking at a problem.
9	I like to generate all the pluses and minuses of a potential solution.
10	Before implementing the solution I like to break it down into steps.
11	I am assertive about pushing things forward.
12	I like to generate criteria that can be used to identify the best option(s).
13	I'm attracted to novelty.
14	I don't naturally spend much time focusing on defining the exact problem to be solved.
15	I like to take in a situation by looking at the big picture.
16	I enjoy working on ill-defined, novel problems.
17	When working on a problem I like to come up with the best way of stating it.
18	I feel a sense of urgency to get things done.
19	I like to focus on creating a precisely stated problem.
20	I enjoy stretching my imagination to produce many ideas.
21	I like to focus on the key information within a challenging situation.
22	I enjoy taking the time to perfect an idea.
23	I find it difficult to bring my ideas to fruition.
24	I have a bias for action
25	Others I work with see me as a results oriented person
26	I really enjoy implementing an idea.
27	I tend to ask lots of questions to get a clear understanding of the situation.
28	I like to work with unique ideas.
29	I enjoy putting my ideas into action.
30	I like to explore the strengths and weaknesses of a potential solution.

31	I enjoy gathering information to identify the root causes of a particular problem.
32	I enjoy the analysis and effort it takes to transform a rough concept into a workable idea.
33	My natural tendency is not to generate lots of ideas for problems.
34	I enjoy using metaphors and analogies to come up with new ideas for problems.
35	People naturally look to me to get the job done.
36	I like to work out carefully crafted solutions.

Note. Retrieved from "FourSight: The Breakthrough Thinking Profile Feedback Booklet" by G. J. Puccio, 2002. Evanston, IL: THInc Communications.

Appendix C

Items from the Basadur 14 Item Ideation-Evaluation Preference Scale

1. I should do some pre-judgment of my ideas before telling them to others.
   1 2 3 4 5 6 7 8 9

2. We should cut off ideas when they get ridiculous and get on with it.
   1 2 3 4 5 6 7 8 9

3. I feel that people at work ought to be encouraged to share all their ideas, because you never know when a crazy-sounding one might turn out to be the best.
   1 2 3 4 5 6 7 8 9

4. One new idea is worth ten old ones.
   1 2 3 4 5 6 7 8 9

5. Quality is a lot more important than quantity in generating ideas.
   1 2 3 4 5 6 7 8 9

6. A group must be focused and on track to produce worthwhile ideas.
   1 2 3 4 5 6 7 8 9

7. Lots of time can be wasted on wild ideas.
   1 2 3 4 5 6 7 8 9

8. I think everyone should say whatever pops into their head whenever possible.
   1 2 3 4 5 6 7 8 9

9. I like to listen to other people's crazy ideas since even the wackiest often leads to the best solution.
   1 2 3 4 5 6 7 8 9

10. Judgment is necessary during idea generation to ensure that only quality ideas are developed.
    1 2 3 4 5 6 7 8 9

11. You need to be able to recognize and eliminate wild ideas during idea generation.
    1 2 3 4 5 6 7 8 9

12. I feel that all ideas should be given equal time and listened to with an open mind regardless of how zany they seem to be.
    1 2 3 4 5 6 7 8 9

13. The best way to generate new ideas is to listen to others then tailgate or add on.
    1 2 3 4 5 6 7 8 9

14. I wish people would think about whether or not an idea is practical before they open their mouths.
    1 2 3 4 5 6 7 8 9

Note.