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Lucy L. Gilson, and Nora Madjar
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CITATION
Radical and Incremental Creativity: Antecedents and Processes

Lucy L. Gilson and Nora Madjar
University of Connecticut

This study extends creativity theory and research by differentiating between 2 distinct forms of creative performance: radical and incremental. It also examines the differential effects of certain antecedents on these two forms of creativity. Results demonstrate that intrinsic motivation, problem-driven, and abstract theory-related creative ideas are associated mostly with radical creativity, whereas extrinsic motivation and ideas that are solution-driven and developed on the basis of concrete practices are linked more closely to incremental creativity. Theoretical and managerial implications are discussed.

Keywords: creativity, motivation, problem-driven, solution-driven

Considerable evidence suggests that employee creativity makes an important contribution to organizational innovation, effectiveness, and survival (Amabile, 1996; Woodman, Sawyer, & Griffin, 1993), and a vast number of organizations are placing a premium on creativity as a driver of success (e.g., Baer & Oldham, 2006). The value of creativity is rarely debated, with theorists going so far as to suggest that the quality of human life is greatly influenced by the creative contributions of individuals (Mumford & Gustafson, 1988). However, in empirical research, creativity has been predominantly examined as a broad and unitary construct (Shalley, Zhou, & Oldham, 2004; Unsworth, 2001). To this end, creativity is generally defined as the production of ideas about products or procedures that are novel or original and potentially useful or practical (e.g., Amabile, 1996; Shalley, 1991).

Creativity may be required by any job (Shalley, Gilson, & Blum, 2000); however, using the above definition, creative ideas can range from minor adaptations or changes in how work is performed to radical breakthroughs and completely new products (Mumford & Gustafson, 1988). Good examples of this can be found in the arts. For instance, if one thinks of the work of Norman Rockwell, no one would argue that it is not creative; however, his work was predominantly in the same medium and followed themes with different pictures representing different aspects of American life (i.e., children, family, and patriotic themes). In contrast, the work of Pablo Picasso ranges from the large black-and-white mural war scene Guernica to portraits (i.e., Igor Stavisky or Gertrud Stein) and large sculptures. With regard to organizational creativity, however, the vast majority of empirical work has defined and measured creativity as if it were a very homogeneous and uniform concept.

Several theorists have noted that there is a conceptual misalignment with creativity being measured in a homogeneous fashion. In other words, how we measure and think about creativity needs to be realigned to more accurately capture the range of what a creative idea can encompass. Specifically, Sternberg (1999) has stated that the “essence of creativity cannot be captured in a single variable” (p. 84), and his work and that of Unsworth (2001) have argued that different work processes and antecedents may promote or hinder more radical ideas, whereas others may influence only incremental improvements and adaptations.

In this work, we propose that it is both theoretically and practically important to differentiate between different forms of creativity, specifically radical and incremental creativity. To date, other than theoretical work (Unsworth, 2001), research has not investigated the potential differential effects of certain antecedents, motives, and processes on these two distinct forms of creativity. To this end, we examine different antecedents to each form, arguing throughout that radical and incremental creativity may not have the same drivers. In doing this, this article is laid out as follows: First, we define radical and incremental creativity. We then discuss the antecedents and stages in the work process expected to influence more radical versus more incremental creativity. Specifically, we focus our attention on intrinsic and extrinsic motivation to use creativity in problem solving and the possible kernel or source of creative ideas. Here, we differentiate between ideas originating from theoretical readings and reflections and those derived from first-hand practical observations and conversations, and whether creativity was prevalent more in identifying and defining the problem, or in coming up with the actual solution. Taken together, we propose that the particular process, motivation, and antecedents are essential determinants to the occurrence of radical versus incremental creative outcomes.

Theoretical Overview

Radical and Incremental Creativity

Creativity has been defined as the production of novel and useful ideas about products, services, or procedures (Amabile, 1996), and conceptual work has suggested that the originality aspect is particularly important. Amabile (1996) and others (e.g., Mumford & Gustafson, 1988) also discuss creativity as a contin-
uum between performances relying on familiar algorithms and minor adaptations to those relying on set-breaking heuristics and radical breakthroughs. However, while there has been discussion on the range of creative ideas and creative continuum, the measurement of the construct has predominantly focused on whether ideas or outcomes are both novel and useful. For example, Oldham and Cummings (1996) asked supervisors to rate their employees work with regard to whether it was “original and practical,” “adaptive and practical,” and “creative.” They stated, “Creativity refers to the extent to which the employee develops ideas, methods, or products that are both original and useful to the organization” (p. 634). Similarly, in another frequently used measure of creativity, Tierney, Farmer, and Graen (1999) asked supervisors to rate their employees using a nine-item measure that asked how often they “demonstrate originality in his or her work,” “found new uses for existing methods or equipment,” and “generated ideas revolutionary to our field” (p. 620). Thus, while both of these measures tap into overall creativity (Shalley et al., 2004), the importance of “novelty” and “usefulness” are not separated out, that is, there is no way to differentiate an idea that is very original and novel and somewhat useful from one that is very valuable and useful, but only somewhat novel.

In contrast, work in the innovation literature has differentiated between the factors that are more radical rather than incremental and often labeled the distinction as explore and exploit (e.g., Dewar & Dutton, 1986; March, 1991; Nord & Tucker, 1987). Here, it has been argued that when a firm’s strategy is focused on incremental change, process management, efficiency, and meeting current customer needs, exploitation rather than exploration will ensue. In contrast, when a firm is directed toward identifying new opportunities that depart from existing skills and customers and focuses on fundamental changes, this is described as a strategy of exploration (Benner & Tushman, 2003). Thus, exploration requires new knowledge and learning and is predicated on radicalness and a departure from what is currently offered or being done (Levinthal & March, 1993; March, 1991). However, it is important to note that both are key drivers of performance and can be equally important to organizational success (Benner & Tushman, 2003).

Given that it has been argued that creativity is the first step or ingredient necessary for innovation, we decided to follow the analogy derived from the innovation literature (Dewar & Dutton, 1986) and distinguish first theoretically and then measure empirically two distinct forms of creativity: radical and incremental. We define radical creativity as ideas that differ substantially from existing practices and alternatives (Nord & Tucker, 1987). Highly radical ideas should suggest new and set-breaking frameworks or processes. For example, switching the nature of a business from a traditional sit-down dine-in restaurant to a “gourmet chefs on call” is a radically new way of selling the expertise and redefining the product. In contrast, incremental ideas are those that imply changes in frameworks and approaches and modifications to the existing practices and products. Modifying, after approaches, an existing fitness center to include assistance is a good example of an incremental idea. It is important to note that, as with innovation, both radical and incremental creativity, although different in scope, are important and one is not necessarily better than the other.

Employee or individual creativity is considered important because it is a means for organizations to remain flexible and to successfully handle their changing customer demands, competition, markets, and technological requirements. However, achieving these ends can be accomplished through different means. On the one hand, researchers discuss the importance of searching for what is new, taking risks, experimenting, playing, being flexible, and discovery (Csikszentmihalyi, 1997). On the other hand, the importance of seeking refinements in product offerings or how work is performed or adopting a continuous improvement model of ongoing adaptation has also received attention (Henderson & Clark, 1990). Although very different, the ideas generated in both scenarios can be considered creative. Work by Taylor and Greve (2006) has argued that while exploration (radical) innovation can result in greater payoffs, there are often greater risks and costs associated with it as well as the potential for losses. Therefore, while exploitations (incremental) may be adding pastel colors to M&Ms at Easter time or changing how products are shipped, the payoff for the individual, group, and organization can be large; however, there is neither the no potential upside or downside associated with exploration (radical).

To further our understanding of the creativity construct, it is important to understand the antecedents and processes promoting radical and incremental ideas. If the antecedents to radical and incremental creativity are in fact different, as we argue next, this should help managers align their work factors so as to achieve their desired goal (i.e., radical or incremental creativity). For example, within an organization, managers in an R&D department might want to have processes in place that foster and encourage radical creativity. In contrast, the managers of an accounting department may want to encourage incremental creativity and help their employees seek ways to improve on what is currently being done. A better understanding of the factors and processes contributing to radical versus incremental ideas may enable organizations to conditionally encourage or discourage radical or incremental creativity in their employees. Establishing the desired conditions for appropriate idea radicalness should more effectively motivate employee idea production that is both appreciated by and useful to an organization.

Hypothesis 1: Creativity is better represented by a two-dimensional construct rather than a single unidimensional one. Specifically, we hypothesize that items will better map onto two correlated dimensions that correspond to incremental and radical creativity than they do to one single creativity dimension.

Intrinsic and Extrinsic Motivation for Creativity

In 2001, Unsworth proposed a typology that focuses on why individuals engage in creativity and what triggers the engagement. Specifically, she argued that research needs to better understand the “reasons” for engaging in a creative activity (driver type) and the type of “problem” being responded to (problem type) because the resulting creativity will be very different. According to Deci and Ryan (1987), behaviors are initiated because of an internal drive or external demands. For example, a wish to be creative or a desire to achieve a goal state represents an internal driver for creativity (Unsworth, 2001). In contrast, a requirement from the job or problem at hand or the pressure for a solution may provide an external drive and “force” an individual to engage in creativity. Although both the external and the internal motivators should result in employee creativity, the form of creativity that ensues
may be different. The innovation literature finds different drivers of exploration and exploitation. For instance, a firm’s capabilities, their overriding strategy along with their practices and processes are said to determine the form of innovation that they engage in (e.g., Benner & Tushman, 2003; Ghemawat & Costa, 1993; March, 1991; Weick, 1995). We argue herein that the antecedents to incremental and radical creativity also may differ.

A great deal of the creativity research has been predicated on an intrinsic motivation framework where it has been proposed that individuals are most creative when they are excited about their work and interested in engaging in it for the sake of the activity itself (Amabile, 1996; Shalley & Perry-Smith, 2001; Zhou, 1998). The belief here is that intrinsic motivation in effect buffers extra-aneous irrelevant concerns and allows employees to take risks, try new things, be playful about their work, link ideas for divergent sources, and persist to the point of breakthrough. In other words, breakthrough ideas, or radical creativity, are more likely to occur when individuals are intrinsically motivated by their work.

In contrast, external sources of motivation (e.g., rewards and supervisor behavior) have the potential to undermine intrinsic motivation (Amabile, 1996) and as such may be unrelated at best, or detrimental at worst, to radical creativity. However, for incremental creativity, where the focus is on adapting what is being currently done or coming up with new uses for existing products, external drivers may play a key role. Oftentimes, employees are asked or even told to come up with a new idea by their boss or a customer. To motivate this behavior, rewards are offered. The relationship between extrinsic rewards and creativity has sparked one of the most heated debates in the literature. One school of thought has argued that extrinsic rewards have a tendency to be perceived as controlling, and as such, employees are less inherently interested in their work, less involved in their task, and consequently less likely to be creative (Amabile, 1996; Amabile, Goldfarb, & Brackfield, 1990). On the other hand, research has argued that extrinsic rewards contingent on performance will signal that creativity is important (Eisenberger, 1992). Signal theory suggests that attention is given to what is rewarded and valued; therefore, if creativity is shown to be valued through rewards, it will follow. It is interesting that research supports both arguments. For example, monetary rewards have been found to result in higher levels of creativity (Eisenberger & Rhoades, 2001). However, those who were not offered rewards have been found to perform more creatively than their counterparts who were rewarded (Kruglanski, Friedman, & Zevei, 1971).

A possible reason for the conflicting findings may lie with the unitary measurement approach to creativity, with differences in radical versus incremental creativity obscured. Meaning that measuring creativity as novel and useful may be masking the effects of extrinsic and intrinsic motivation on the two different forms of creativity. We further propose that radical creativity may be unaffected by rewards because individuals may not need rewards to pay attention to finding breakthroughs. For radical creativity, deeper processing, experimentation, and more mental persistence should be a key driver, whereas for incremental creativity, the reward or external driver may be a key motivating force. These differences in underlying cognitive processes are important because, as others have suggested (Amabile, 1996; Shalley & Perry-Smith, 2001; Unsworth, 2001), internalized sources of motivation (e.g., intrinsic motivation, self-efficacy) will be more likely to facilitate the kind of cognitive processes we suggest are necessary to yield radical creativity. By extension, externalized sources of motivation (e.g., rewards and supervisor behavior) may have the potential to undermine intrinsic motivation (Amabile, 1996). In contrast, incremental creativity should be less dependent on deep cognitive processes and, in fact, may benefit from motivational factors that discourage deep thinking. Therefore, external motivators that draw attention to the continual search for adaptations, refinements, and improvement are likely to be more effective for incremental creativity. Here, the reward or external motivators signal that the change is desired and should encourage employees to seek alternatives.

Hypothesis 2: The relationship between intrinsic motivation and radical creativity will be significantly greater than the relationship between intrinsic motivation and incremental creativity.

Hypothesis 3: The relationship between extrinsic motivation and incremental creativity will be significantly greater than the relationship between extrinsic motivation and radical creativity.

Problem-Driven and Solution-Driven Creativity

Problem solving is a multifaceted event where there are opportunities to be creative or not at a number of different stages in the process. For instance, problem solving starts with the identification of an issue or problem that is challenging or has potential, followed by the generation of alternative solutions, and finally the selection of a meaningful solution or outcome. Some have argued that creativity is most necessary in the early stages of coming up with a problem or deciding on what issue to undertake (Ford & Sullivan, 2004). We propose that the stage in the process may be linked to whether the creativity that ensues is more radical or incremental. Specifically, when individuals focus on earlier stages of the decision-making process (i.e., problem identification or construction), the ensuing creativity may be more radical. In contrast, when the focus is on the later stages of the process (the solution), creativity may be more incremental.

When individuals face a question, problem, or issue that is new to them or ill-defined, they need to first identify and formulate the problem space. At this stage, there is a great deal of potential to introduce novelty and originality—or to be radical with regards to creativity. At the early stages of problem solving, often labeled construction, information has yet to be gathered or analyzed and, thus, the issues at hand are more likely to be perceived as new, with less history or status quo from which to generate alternatives; hence, there is, in effect, tabula rasa for radical creativity. Prior research has found that during problem construction, enhancement and searching are some of the key cognitive processes that are engaged in (Mumford, Baughman, Threlfall, Supinski, & Costanza, 1996; Mumford, Reiter-Palmon, & Redmond, 1994). Furthermore, during problem construction, individual personality differences can influence the creativity of ideas generated (Reiter-Palmon, Mumford, & Threlfall, 1998). At this early stage of the decision-making process, different heuristics are applied that can result in conceptual construction and subsequently more original ideas being generated (Scott, Lonergan, & Mumford, 2005). Cre-
ativity at these initial stages of the problem-solving process may have the advantage of establishing a standard or expectation for novelty right from the start. It is easier to introduce a new frame of reference and overcome some of the resistance for change prevalent in established practices.

In contrast, when the focus of problem solving is on finding a solution to an already defined problem, the solution-driven nature of the process may stifle radical creativity but enhance incremental creativity. In effect, solution-driven creativity may have the advantage of proposing a new avenue or means of using previously tried and tested problem-solving strategies. In effect, solution-based decision making is one where key facts are sought and the search is for ideas that appear useful. Combining concepts has been found to result in more relevant rather than original outcomes (Mobley, Doares, & Mumford, 1992).

Much of the focus in quality management is in using established problem-solving methodologies and stages to help ensure that quality decisions are reached. Along the way, however, radical alternatives are either not considered or systematically culled as they do not fit with the predetermined decision trees or methodologies. Hence, the solution-driven nature of the problem itself may restrict the final outcome such that the ideas generated and solutions considered are incremental. In other words, whereas process-based problem-driven decision making focuses on variance expansion, solution-driven decision making focuses on variance reduction. Therefore, a solution-based approach to problem solving may not result in the generation of radically creative ideas.

Hypothesis 4: Ideas that are problem rather than solution driven will be more strongly related to radical than incremental creativity.

Hypothesis 5: Ideas that are solution rather than problem driven will be more strongly related to incremental rather than radical creativity.

Concrete Practice and Abstract Theory as Idea Sources

Related to our arguments developed above regarding the stage in the decision-making process on which individuals focus is the notion of where ideas come from, especially in the problem construction phase of decision making (Reiter-Palmon et al., 1998; Scott et al., 2005). The creative process has been described as involving several stages (Wallas, 1926), including preparation, incubation, insight, and verification. Incubation is commonly associated with the “aha” factor, where when faced with a problem that individuals cannot solve, time away from the problem (e.g., working on another task, taking a shower, exercising) leads to a breakthrough idea. That is, incubation occurs when the individual is no longer consciously working on the task but is unconsciously still processing information that will ultimately lead to new combinations of ideas (Csikszentmihalyi & Sawyer, 1995; Segal, 2004; Smith & Dodds, 1999).

Given this, individuals can come up with new ideas in either n the actual context where the problem or issue occurs or when they are further removed from the problem itself and involved in related or unrelated activities. Here, we propose that where the incubation of the idea occurs may lead to differences in whether the ideas generated are radical or incremental.

When individuals are away from the direct source of their work, we propose that there is a greater likelihood that they will, consciously or not, explore different perspectives and ultimately achieve more breakthroughs. This argument seems particularly relevant when comparing the context of direct observation and experiences with that of reflection and abstract theoretical models that are more remotely associated with the issue at hand. Therefore, the two very different sources of new ideas or kernels for creativity should result in different creative outcomes. Work examining conceptual construction has found that case-based reasoning often results in more original ideas (Scott et al., 2005). Case-based reasoning suggests that goals and the performance setting are cross-referenced to outside materials and past experiences, thus yielding more creative ideas (Mumford, Blaire, & Marcy, 2006).

In contrast, some creative ideas are generated on the basis of observation of a current practice or within the situation in which they are to be applied. This more associative approach to creativity suggests that ideas come from stimuli that are observed repeatedly, and models are held in the mind that then facilitate the generation of new ideas (Mumford et al., 2006). Therefore, ideas generated within practice may reveal dissatisfaction with the status quo or the desire for changes to be made to what is currently being done. Hence, these ideas are more likely to result in modifications and adjustments or incremental creativity. Conversely, to come up with a radically creative idea or a completely new and original solution, and even to create a new nonrecognized problem, individuals may need to draw on information sources outside of the domain within which they are currently working. Sources outside of one’s work may facilitate analogies and linkages to different theoretical models or unproven but alluring ideas that provide a different perspective. That is, inspiration for a new idea from outside the regular context and the routine practice is more likely to lead to something radically new rather than experimenting or thinking about the actual problem. Thus, we propose that creativity originating from concrete experience or practice will be incremental in nature, whereas when individuals use theoretical models and reflection or more remote associations, more radical ideas will ensue.

Hypothesis 6: Ideas generated in abstract theory will be more strongly related to radical than incremental creativity.

Hypothesis 7: Ideas originating in concrete practice will be more strongly related to incremental rather than radical creativity.

Method

Design and Participants

Participants for this study were undergraduate students at a large northeastern university enrolled in a senior-level business consulting class. For the class, students had to identify a business to work with and then work on a project with this company for 15 weeks. A total of 148 students agreed to participate in the study. The response rate was 67%. The average age of participants was 20.8 years; 62 (42%) were men.

As part of the course, the participants had to find on their own an organization to work with, identify a problem within the company, and come up with new and practical solutions that they...
believed would help the company. The participants completed three surveys at three separate times: before they started their work on the project, after they submitted the first draft of their project to the instructor (4 weeks before the end of the semester), and after they completed their report and presented the results to the representatives from their organizations.

In the first survey, participants were asked for demographic information. In the second survey, the focus was on the processes the participants used while working on the project and, more specifically, whether they were creative in figuring out the problem or in coming up with alternative solutions. Also in this wave, we asked a number of questions regarding why creativity was used in the project and whether their ideas were predicated on theory and readings or interactions with the company and observations.

In the third survey, the participants were asked to evaluate the extent to which their final project, or the outcome, exhibited radical or incremental creativity. To avoid common method bias, the self-evaluation was done a month after the survey on processes. Although self-report measures are subject to bias, they have been found to correlate (.62) with supervisory ratings of creativity (Axell et al., 2000), and it has been argued that participants are best suited to self-report creativity because they are the ones who are aware of the subtle things they do that make them creative (Janssen, 2000). For instance, creativity can be more than just novel and useful products in that some individuals may use very creative processes to conduct their work regardless of the level of creativity attained in the final product.

**Measures**

Unless otherwise noted, responses to all items were made along a 7-point Likert-type scale, with possible answers ranging from 1 (strongly disagree) to 7 (strongly agree).

**Incremental and radical creativity.** Eight items were used to assess the two forms of creativity. Creativity was measured at Time 3 after the students had completed their final projects, presented their findings to the client, but had not received their grade from the instructor. To measure both forms of creativity, we asked the participants to rate the extent to which they agreed or disagreed with some descriptions of their final project. Sample items for each scale include, “Your project presents refinement on how things are currently done within the company” (incremental) and “Your project presents discoveries of completely new processes or products than what the company currently does” (radical).

To ascertain whether there were in fact two separate factors and the items loaded appropriately, we conducted an exploratory factor analysis. Four items loaded on each factor, with the resulting factor loadings being at or above .66 to the appropriate factor, explaining 60% of the variance. Furthermore, each scale demonstrated acceptable reliabilities: incremental creativity $\alpha = .73$, and radical creativity $\alpha = .79$.

**Intrinsic and extrinsic motivation for creativity.** To measure the motivation for engaging in creativity in this project, we asked the participants, at Time 2, to indicate their reason for being creative with the following items: (a) out of necessity; (b) originality was a requirement; (c) for the sake of it, because they like to come up with new ideas; and (d) they enjoyed the challenge. An exploratory factor analysis demonstrated that two factors corresponding to intrinsic and extrinsic motivation explained 57% of the variance, with item loadings on the appropriate factors at .68 or above. As expected, the results yielded two factors with eigenvalues above 1.00 that accounted for 68% of the variance. All item loadings on the respective factors were .76 or above. We averaged item scores to form an intrinsic and extrinsic motivation scale ($\alpha = .70, .60$), respectively.

**Problem- and solution-driven creativity.** To understand at what stage in the decision-making process creativity was employed, we developed two items that defined the different stages in the process (problem definition and solution search) and then asked participants how creative they were at each stage. For creativity at the problem stage, we asked participants how creative they were during the “diagnoses, identification, and formulation of a problem to work on” (problem stage). Possible responses were rated on a 5-point Likert-type scale, with anchors ranging from 1 (not at all creative) to 5 (highly creative). Next, we asked participants how creative they were in “the creation of alternatives and decisions on the proposed final solution for their chosen problem” (solution stage) using the same anchors. Not surprisingly, the two items were not correlated, and an exploratory factor analysis showed two separate factors. That is, being creative or using creativity in the problem formulation stage did not necessarily mean using creativity at the solution generation stage.

**Concrete practice-related and abstract theory-related ideas.** To measure whether ideas originated from more practice- or more theory-related activities, we asked participants in the second survey to indicate the activities they associated as the setting in which they came up with their most original ideas. Participants were asked to indicate their level of agreement or disagreement that their creative ideas arose while they were (a) talking to representatives from the company, (b) observing what was happening in the organization, (c) reflecting on their observations and conversations, (d) reading management materials, and (e) reflecting on the management theories and materials. An exploratory factor analysis was performed to validate the items and the factor structure. The rotation extracted two factors with eigenvalues above 1.00 that accounted for 68% of the variance. All item loadings on the respective factors were .76 or above. The first three items loaded together, suggesting a more practice-driven focus, and the last two items loaded together, suggesting a more theory-driven focus. We averaged item scores to form a practice-driven and theory-driven scale ($\alpha = .68, .73$), respectively.

**Results**

Table 1 contains descriptive statistics and interitem correlations for all variables involved in the study. As shown in the table, the correlation between radical and incremental creativity was moderately significant and negative ($r = - .30, p < .01$). In addition, the factor analysis performed also supports the notion that radical and incremental creativity represent two separate forms of creativity, thus providing initial support for Hypothesis 1.

**Differential Relationships With Incremental Versus Radical Creativity**

To assess whether the relationships between a given antecedent or process and the two forms of creativity are comparable (Hypotheses
2–7), we conducted several regression analyses. First, regression analyses were conducted so that the relationship between the antecedents and each form of creativity could be assessed. Two sets of regressions were conducted—one for each form of creativity. From these, comparisons can be made between the significance levels of the betas for each factor across the regression equations, with radical creativity versus incremental creativity as the dependent variable. Results from these analyses are reported in Table 2. As shown, intrinsic motivation, abstract theory-related, and problem-driven ideas made positive and significant contributions to radical creativity (respectively, $\beta = .20, .20, .17; p < .05$). The results in the second column of Table 2 show that extrinsic motivation, concrete practice-related, and solution-driven ideas contributed to incremental creativity (respectively, $\beta = .26, .27, p < .01$, and $\beta = .16, p < .05$). These results provide initial support for all of our hypotheses.

While a difference in $p$ value for each factor’s beta across these equations is relevant to our hypotheses, the true test of our hypotheses required a more rigorous analysis. To examine whether the magnitude of the relationship between the antecedent and each type of creativity was indeed statistically significant requires a test of the difference between betas for different dependent variables from a single sample (Cohen, Cohen, West, & Aiken, 2003). Whether the difference in magnitude in the relationship between the antecedent of interest and each form of creativity is statistically significant is indicated by the significance of that antecedent’s beta weight in a regression equation where the dependent variable is a variable representing the difference between radical creativity and the standardized predicted value of incremental creativity derived from regression equations using the same set of independent variables. Results from this analytic approach are reported in Table 2. Indeed, results from these analyses indicate that the relationships between intrinsic motivation theory as a source of ideas and problem-driven ideas and radical creativity than they are to incremental creativity. The association between extrinsic motivation, practice-related ideas, and solution-driven ideas are significantly stronger for incremental creativity. Therefore, results from all regression analyses fully support Hypotheses 2–7. In addition, the different factor structure for incremental and radical creativity along with the clear difference in antecedents support Hypothesis 1, that creativity is better represented by a two-dimensional construct (radical and incremental) rather than as a single construct.

### Discussion

In this study, we first focused on empirically differentiating between two forms of creativity—radical and incremental—that have been theorized in the creativity literature but not measured. Second, we also examined the work processes and antecedents that are related more to one rather than the other creativity dimension or that may determine the resulting creative outcome. Consistent with our expectations, factor analysis results indicate that the measures of incremental and radical creative performance appeared as distinct constructs. In addition, our regression results demonstrated that the two creative outcome measures (radical and incremental) were related to different antecedents and processes. More specifically, intrinsic motivation, abstract theory-related ideas, and problem-driven creativity were related to radical creativity. However, extrinsic motivation, concrete practice as the source of ideas, and creativity being needed or exhibited only in finding the solution were associated with incremental creativity.

Given that the two forms of creativity appeared to be guided by different antecedents, one of the implications of these results is that it is important for organizations to understand the form of creativity they seek from their employees because the predictors of radical versus incremental ideas are different. By providing the right context and stimulating the right work process for radical or incremental creativity, managers may be more effective in motivating the more appropriate form of creative ideas, the ones that will be beneficial for the organization or project at hand.

The study also contributes to our knowledge of how the work process or, more specifically, the stages in it where creativity is employed influence the final project. That is, in line with some

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**Table 1**

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<td>.28**</td>
<td>-.06</td>
<td>-.3</td>
</tr>
</tbody>
</table>

*p < .05.  **p < .01.

---

**Table 2**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Radical creativity</th>
<th>Incremental creativity</th>
<th>Incremental vs. radical comparison</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intrinsic motivation</td>
<td>.20*</td>
<td>.10</td>
<td>-.30**</td>
</tr>
<tr>
<td>Extrinsic motivation</td>
<td>-.04</td>
<td>.26**</td>
<td>.23**</td>
</tr>
<tr>
<td>Abstract theory-related ideas</td>
<td>.20*</td>
<td>-.12</td>
<td>-.44**</td>
</tr>
<tr>
<td>Concrete practice-related ideas</td>
<td>.04</td>
<td>.27**</td>
<td>.11</td>
</tr>
<tr>
<td>Problem-driven creativity</td>
<td>.17*</td>
<td>-.07</td>
<td>.36**</td>
</tr>
<tr>
<td>Solution-driven creativity</td>
<td>-.08</td>
<td>.16</td>
<td>.25**</td>
</tr>
<tr>
<td>$R^2$ total</td>
<td>.16</td>
<td>.19</td>
<td>.63</td>
</tr>
<tr>
<td>$F$ total $df(6, 117)$</td>
<td>3.70**</td>
<td>4.48**</td>
<td>32.93**</td>
</tr>
</tbody>
</table>

*Entries are standardized beta coefficients.

*p < .05.  **p < .01.
previous studies at the team level of analysis (Ford & Sullivan, 2004), our results demonstrate that using creativity in the initial stages of a project leads to more original and radical solutions in the final outcomes. Using creativity only in finding a solution to an existing problem, without reexamining the problem itself, may lead to more incremental creativity. In this respect, organizations interested in radical creativity should encourage and stimulate creativity in the early stages of a project and encourage problem redefinitions and reformulation rather than focusing on finding a new solution to an existing problem.

Our results provide some insights into the relations between radical and incremental ideas and the creative process and how facilitating its stages and, more specifically, the incubation step may lead to more radical versus incremental creativity. Our findings confirm the notion that to support remote associations, one needs to be involved in a period of incubation and be at least partially removed from the concrete experiences or problem he or she is trying to solve (Segal, 2004; Smith & Dudds, 1999). That is, after some period of preparation or delving into a problem, to stimulate radically new ideas and creative thinking, it is better to draw ideas from more abstract models and theories than from the concrete experience.

Limitations

As with any study, there are limitations associated with this work, one being that all our data are single source. However, to overcome this, we collected our data at different points in time such that there is a causal chain here. Nevertheless, future work should consider having others also rate incremental and radical creativity. That said, this presents an interesting research dilemma in that what may be considered incremental to one may be radical to another. For example, in our study, the students were acting as consultants to a company. Therefore, they did not have a great deal of company background or knowledge. In this case, they may present an idea that they considered to be completely radical and a break from the status quo of what the company is currently doing. However, the company may have considered this idea or even may have done some of it in the past; therefore, the company representative might rate the idea as incremental rather than radical.

Another limitation of our study is that our data are from a student population that was working for a semester in a consulting capacity with a firm. This is probably not the ideal setting in which to capture a full range of radical and incremental creative ideas. That said, we did find differences in the creativity ratings and their antecedents, which speaks to the need to continue work along this line of inquiry. In addition, all students worked on different projects, which does not allow for the projects to be controlled or accounted for. While this is a limitation analytically, it is also a generalizability strength in that employees and consultants do not all work on identical projects, and the guidelines, resources, and constraints often vary tremendously—this too was the case with the student projects and, yet, we find an interesting and robust pattern of results with regard to the antecedents to radical and incremental creativity.

According to the interactionist perspective of creativity (Amabile, 1996; Woodman et al., 1993), individual and contextual characteristics are expected to interact in determining the level of creativity. To this end, a great deal of work in the creativity literature has focused on individual differences such as creative personality, self-efficacy, cognitive style, and personality characteristics, such as the willingness to take risks and creative thought processes and problem construction ability (Reiter-Palmon et al., 1998). Each one of these characteristics may influence whether an individual is more likely to engage in incremental or radical creativity. Furthermore, these characteristics may interact with a number of the antecedents considered here. Therefore, we believe there are a large number of fascinating topics for future research.

To this end, we hope that going forward, research will continue to examine creativity as a multidimensional construct and consider how the individual, group dynamics, and organizational drivers affect each form.

Conclusions

Theoretical work has called for the delineation of the creativity construct. In this study, we present one of the first empirical tests of whether creativity can be split into radical and incremental forms. Furthermore, we find that the antecedents to both forms of creativity are, as expected, different. This is an important step in creativity research as a number of studies have found conflicting results (see Shalley et al., 2004, for a review) when examining the antecedents to creativity, and a potential explanation for the lack of consistent findings may reside in how the dependent variable of creativity is being measured or, in this case, truncated. We hope that these findings will generate additional empirical work as well as add value to the practice of managing employees to be creative in their work.

References

Dewar, R. D., & Dutton, J. E., (1986). The adoption of radical and


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