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Leadership and Creativity in the Indian R&D Laboratories: Examining the Role of Autonomous Motivation, Psychological Capital and Justice Perceptions

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W.P. No. 2013-11-09
November 2013

INDIAN INSTITUTE OF MANAGEMENT
AHMEDABAD-380 015
INDIA

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Abstract: The present study investigates the association between R&D-specific leadership approach developed in the Indian context using a combination of qualitative and quantitative data analyses, employee autonomous motivation, psychological capital, fairness perceptions and creativity. Creativity construct was conceptualized as comprising of both behaviors and outcomes. Creative behaviors comprise of idea development (generation and promotion) behaviors and work engagement, while creative performance was measured using quantifiable outputs. Using survey data from 482 scientists in the Indian R&D laboratories, the study found that leader behaviors are directly related to autonomous motivation and justice perceptions that, in turn, are positively related to psychological capital and creative behaviors. Psychological capital is also positively related to creative behaviors. The study found significant positive relationship between work engagement and creative performance. The results of this study provide support for the leadership model and its association with employee perceptual variables, behaviors and objective performance.

Keywords: R&D leadership; organizational justice; motivation; psychological capital; creativity.

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INTRODUCTION

Today, creativity at workplace is a hot topic. A recent 2010 IBM survey of more than 1,500 Chief Executive Officers from 60 countries and 33 industries worldwide found that more than rigor, management discipline, integrity or even vision, successfully navigating an increasing complex world will require employee creativity (IBM, 2010). Creativity, defined as the production of novel and useful ideas by an individual or by a group of individuals working together, has been found to contribute to employee performance and to organizational innovation and effectiveness (Amabile, 1983; Montag, Maertz Jr., & Baer, 2012; Shalley, Gilson & Blum, 2000; Zhang & Bartol, 2010). Of all the forces that impinge on an employee's daily experience of the work environment in organizations, one of the most immediate and potent influence is likely to be that of her supervisor, who directs and evaluates work, facilitates or impedes her access to resources and information, and in a myriad of other ways touches her engagement with tasks and with other people (Amabile, Conti, Coon, Lazenby, & Herron, 1996; Amabile, Schatzel, Moneta, & Kramer, 2004).

Although leadership is potentially one of the most influential factors in an employee's work environment, research exploring the relationships between leader behaviors and employee creative performance (quantifiable outcomes) is sparse and inconclusive (Amabile et al., 2004; Dewett, 2007; Mumford, Scott, Gaddis & Strange, 2002; Oldham & Cummings, 1996). While Dewett (2007) found no significant relationship between supervisory encouragement and creative outcomes, Oldham and Cummings (1996) found a completely different pattern of relationships depending on type of measure (subjective or objective) used. Given that objective creative outcomes are the ultimate goal and that the subjective ratings of creativity are only useful to the organization to the degree that they are related to instances of novel and useful outcomes, it is essential that scholars must turn their attention to understanding what may be a very different phenomenon (Dewett, 2007). The aim of the present study is to examine the relationship between leader behaviors and employee creative performance.

Given the intuitive appeal of the assertion that leader behaviors are likely to have their strongest and most immediate impact on subordinate perceptions, it is surprising that there is little research testing the behavior-perception connection (Shin & Zhou, 2003; Zhou & Oldham, 2001). The present study develops and tests a framework delineating the processes that have high potential to explain the impact of leadership on employee creative performance. The paper examines the role of justice perceptions, autonomous motivation, psychological capital and creative performance behaviors as intermediating variables for the leadership-creative performance relationship. The role of a few of these variables on employee creativity has been tested individually in some studies (e.g. Dewett, 2007; George & Zhou, 2007; Rego, Sousa, Marques, & e Cunha, 2009). However, a holistic examination of the relative contributions of these variables on employee creative performance has been absent from the literature.

Research and Development (R&D) work is a driving force of the global economy and the main source of innovation, at least on a scientific basis (Ángel & Sánchez, 2009; Dewett, 2007). The self-image of R&D employees is usually that of men who make things work, avoid waste of time, capital, and labor, and are independent in thought and action. When an occupational group sees itself, and is seen by others, as playing the critical role in the achievement of broader societal goals, it tends to demand quite different kind of authority relationships as compared to those that are seemingly performing less critical roles (Kakar, 1971, 1977; Zheng, Khoury, & Grobmeiher, 2010). The present study examines the behaviors of R&D leaders and establishes an empirical basis for understanding their function in today's R&D organizations.

A clear problem with most organizational behavior measures, including leadership measures, is that they were developed in the United States (Liden, 2012). Uncritical adaptation of practices and techniques evolved in the context of Western cultural values may not be effective in other socio-cultural environments (Aycan et al., 2000; Dorfman, Howell, Hibino, Lee, Tata, & Bautista, 1997; Shalley, Zhou, & Oldham, 2004; Shin & Zhou, 2003). While multiple motives underlie employees' reactions to workplace relationship, the saliency of these motives can differ as a function of cultural values (Erez & Nouri, 2010; Morris & Leung, 2010; Shao, Rupp, Skarlicki, & Jones, 2013). India of today is composed of two parts – one that is traditional and inward-looking, characterized by older traditions and values of collectivism and high power

distance (Hofstede, 2001; Sinha & Sinha, 1990), and the other that is unconventional and outward-looking characterized by values like individualism and low power distance (Fang, 2009; Sinha, 2008). While Indians have historically had a strong preference for personal relationships, paternalistic leadership, loyalty and dependability over efficiency and independence (Aycan et al., 2000; Kakkar, 1978; Sinha, 1990; Sinha & Sinha, 1990; Pellegrini, Scandura, & Jayaraman, 2010), educational institutes like the Indian Institutes of Technology (IITs) and Indian Institutes of Management (IIMs) have served to inculcate Western values into the Indian mindset. Increasing ease of access to technology and increasing opportunities to work abroad post-liberalization (post 1991) have led to an enhanced exposure of Indians to the ideals of Western societies. These experiences have led to the constitution of a composite mindset having overlapping and consistent as well as inconsistent and contradictory beliefs, values, norms, and behaviors (Sinha, 2008). The present study examines the relationship between leadership and creative performance in the Indian R&D context and suggests mediating mechanisms that may explain this relationship.

The study provides evidence for a positive relationship between leadership and creative performance. The relationship is fully mediated by creative behaviors. Employees engage in behaviors first, and behaviors lead to creative outcomes. The association between behaviors and outcomes is small (but positive and significant) suggesting that there may be other factors (contextual, demographic) that may influence performance. Relationship between leadership and creative behaviors is fully mediated by justice perceptions, autonomous motivation and psychological capital. Leadership is directly related to justice perceptions and autonomous motivation that, in turn, are related to psychological capital.

LITERATURE REVIEW AND HYPOTHESES DEVELOPMENT

R&D-Specific Leader Behaviors

Research designs that include a multi-theory, multi-methods approach in a single culture have the potential to increase our understanding of leadership processes (Palrecha, Spangler & Yammarino, 2012). Most of the studies testing the impact of leadership on employee creativity are inspired by the popular behavioral conceptualizations (e.g. transformational leadership – Gong, Huang, & Farh, 2009; consideration-initiating structure – Stoker, Looise, Fisscher, & De

Jong, 2001; leader-member exchange – Tierney, Farmer & Graen, 1999). The apparent differences between the leadership requirements of traditional and R&D environments suggest that conventional measures of leadership may apply only partially to empowered R&D environments (Arnold, Arad, Rhoades, & Drasgow, 2000; Khatri, 2005; Yukl, 1999, 2008). For example, the transformational leadership, as conceptualized by Bass (1985) and measured by the popular Multifactor Leadership Questionnaire (Bass & Avolio, 1990), does not include behaviors like inspiring, developing, empowering, team building, and leading by example (Yukl, 1999). Moreover, the validity of the questionnaire and transformational/transactional conceptualization is questionable (Van Knippenberg & Sitkin, 2013). In a comparative study of leadership approaches in India, Palrecha et al. (2012) found that the local organization-specific leadership approach explained greater variance that transformation or nurturant-task leadership model. Considering the evidence, a new behavioral measure of leadership that is sensitive to the requirements of R&D environment is, therefore, needed.

Gupta and Singh (2013) identified a set of leader behaviors that may impact employee creativity in the R&D context. The item inventory was derived through an inductive, or bottom-up, investigation of leader behaviors in R&D laboratories across India. Such an approach improves the comprehensiveness and validity of the leader behavior instrument (Arnold et al., 2000; Khatri, Templer, & Budhwar, 2012). The study was based on in-depth interviews conducted with 52 scientists of five Indian R&D labs located in different parts of India. The interview transcripts were content coded and a list of behavior items were generated. The list of items was given to five doctoral students to sort them into different behavior categories. Each incident was coded using a modified version of the leader behavior taxonomy presented in the Managerial Practices Survey (MPS) (Yukl, Wall, & Lepsinger, 1990). Based on the consistency score, a final inventory of 52 behavior items representing 13 behavior categories was generated. A quantitative analysis of the behavior inventory was performed to provide evidence regarding the underlying factor structure and to assess the psychometric properties using data collected from 584 R&D professionals (Gupta, Singh, & Khatri, 2013). A final set of 39 items were developed. Exploratory and confirmatory factor analyses revealed five leader behavior categories, namely, task-oriented, recognising and inspiring, empowering, team-building and developing, and

leading-by-example. In this article, this 39-item inventory has been used for measuring leader behaviors in the R&D environment.

Employee Creativity Construct

Although creativity researchers (e.g. Amabile, 1983, 1996) make explicit acknowledgment of creative performance behaviors, it has not received attention commensurate with its importance. In a review of creativity criterion constructs, Montag et al. (2012) observed that the measures used in creativity studies conceptually confound behaviors with the outcomes of the behaviors. They argued that creative performance behaviors, defined as the set of interdependent observable and unobservable activities that occur in response to a non-algorithmic task or project and that purportedly constitute the creative process, are an antecedent of creative performance, defined as idea, prototype and products judged by relevant stakeholders to be both novel and useful. While exhibiting creative behaviors is within the control of employees, there are a number of environmental factors outside of employees' control that may help drive creative performance (Dewett, 2007; Zhang & Bartol, 2010). For example, even though a scientist displays idea generation behaviors, the eventual output may depend on factors like teamwork, technology used, market forces etc. Literature testing the relationship between subjective antecedent variables and objective creative performance is sparse and inconclusive. Oldham and Cummings (1996) found a completely different pattern of relationships depending on type of measure used. Dewett (2007) found no significant relationship between intrinsic motivation, supervisory encouragement and creative outcomes. In the present study, creative performance behaviors are considered to be antecedent of creative performance, and we measure both separately.

Behaviors that lead to creative output can be broadly classified into *problem identification, information search and coding, idea generation* and *idea promotion* behaviors (Janssen, 2000; Khazanchi & Masterson, 2011; Montag et al., 2012; Zhang & Bartol, 2010). Problem identification, information search, and idea generation behaviors culminate in generating innovative ideas to tackle a problem (Reiter-Palmon & Illies, 2004; Zhang & Bartol, 2010). The idea promotion behavior deals with employees persuading others (seniors, supervisors, colleagues) to accept and recognize their ideas as creative and allow for their implementation (Janssen, 2000). Research (e.g. Zhang & Bartol, 2010) has shown that there exists high degree of

overall amongst these behaviors and we refer to these behaviors put together as *idea development behaviors.*

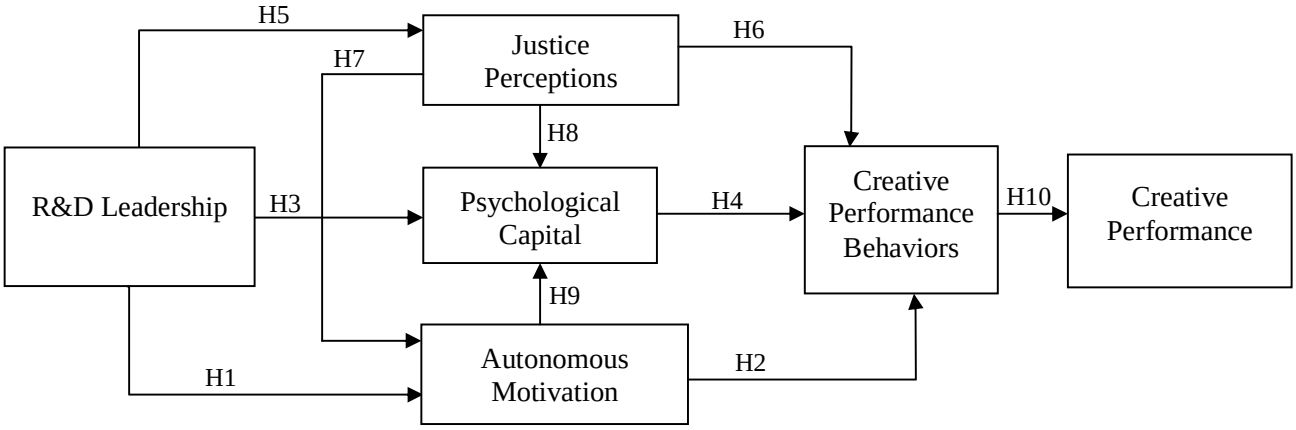
Work engagement refers to a positive fulfilling, work-related state of mind that is characterized by vigor, dedication, and absorption (Schaufeli, Salanova, Gonzalez-Roma & Bakker, 2002). Vigor is characterized by high levels of energy and mental resilience while working, the willingness to invest effort in one's work, and persistence even in the face of difficulties. Dedication refers to being strongly involved in one's work and experiencing a sense of significance, enthusiasm, inspiration, pride and challenge. Finally, absorption is characterized by being fully concentrated and happily engrossed in one's work, whereby time passes quickly and one has difficulties with detaching oneself from work. As opposed to psychological engagement (Kahn, 1990), work engagement is exhibited and measured in terms of observable behaviors (Schaufeli, Bakker, & Salanova, 2006). The work engagement model (Bakker & Demerouti, 2007, 2008) presents engagement to be an antecedent of creativity. Engaged employees are likely to exhibit active learning behaviors (Bakker, Demerouti, & Ten Brummelhuis, 2012; Hyvonen, Feldt, Salmela-Aro, Kinnunen, & Mäkikangas, 2009), proactive behaviors (Sonnentag, 2003), and mobilize their own personal and job resources (Bakker, 2010). In the present study, work engagement has been included as a creative behavior that exists as an antecedent to creative performance.

Development of Theoretical Model

Figure 1 presents the theoretical model tested in the study. One important implication of the 'creative performance behavior → creative performance' relationship is that a number of commonly examined predictors of creative performance are likely to only impact it *indirectly* – to the extent that they *directly* influence creative behaviors (Montag et al., 2012). For example, leadership is likely to predict certain creative behaviors rather than having a direct effect on creative performance. Given the direction of the causal effect of behaviors on outcomes, it is reasonable to assume that the effects on performance of these previously studied antecedents are mediated by changes in the various creative performance behaviors (Khazanchi & Masterson, 2011; Montag et al., 2012; Zhang & Bartol, 2010). The workplace factors (e.g. leadership) are likely to impact employee perceptual variables and creative behaviors that exist independently

and, in turn, affect outcomes. The next part of this section develops the theoretical model linking leadership to creative performance through justice perceptions, autonomous motivation, psychological capital and creative performance behaviors.

Figure 1. Conceptual Model



Leadership, Autonomous Motivation and Creative Performance Behaviors

Autonomous motivation comprises both intrinsic motivation and the types of extrinsic motivation in which people have identified with an activity's value and ideally will have integrated it into their sense of self (Deci & Ryan, 2008). Leadership is one contextual factor that can potentially influence employee autonomous motivation by fulfilling these three innate psychological needs, namely, need for autonomy, need for competence, and need for relatedness (self determination theory – Deci & Ryan, 2000; Ryan & Deci, 2000). Social-contextual events like feedback, communications and recognitions lead to feelings of competence (Dewett, 2007; Ryan & Deci, 2000). Developmental feedback, informational evaluation and freedom from demeaning evaluations have been found to fulfill need for relatedness (Charbonneau, Barling, & Kelloway, 2001; Shalley & Perry-Smith, 2001; Zhang & Bartol, 2010). Choice, acknowledgment of feelings and opportunities for self-direction lead to enhanced autonomous motivation through greater perceptions of autonomy (Charbonneau et al., 2001; Richer & Vallerand, 1995).

Creativity is often enacted in teams (Ángel & Sánchez, 2009; Hirst, Van Knipenberg, & Zhou, 2009). Leaders, by emphasizing team work, can increase the frequency of interactions between the team members, thereby, leading to a greater understanding of the problem and to its creative

solution (Hoegl, Weinkauf, & Gemuenden, 2004; Mumford et al., 2002). Learning can take place vicariously by modeling and self-control processes (Bandura, 1997). Individuals are more likely to perform a work after a visual demonstration of a successful behavior or through the transmission of examples of appropriate rules and thought processes (Shalley & Perry-Smith, 2001). Employees who work under leaders who are expert in their work and who lead by example are bound to be subjected to much more modeling experience that can enhance their competence and eventually creativity at work.

Autonomous motivation plays an important role in determining behaviors that may result in creative outcomes. When people are autonomously motivated, they experience volition, or a self-endorsement of their actions (Deci & Ryan, 2000, 2008). Interest in a particular task makes the difference between what an individual can do and what an individual will do (Amabile, 1997). When individuals are involved in their work, they are more likely to devote all of their attention to the problems they encounter (Simon, 1967). Such attention directs people to engage in creative behaviors through self-regulation and influences the extent to which an individual will persist in carrying out the assigned role (Zhang & Bartol, 2010). Thus, we hypothesize:

H1: R&D leader behaviors (a: task-oriented; b: recognizing and inspiring; c: team building and developing; d: empowering; and e: leading-by-example) will be positively related to autonomous motivation.

H2: Autonomous motivation will be positively related to creative performance behaviors (a: idea development behavior; and b: work engagement).

Leadership, Psychological Capital and Creative Performance Behaviors

Psychological Capital has been defined as "an individual's positive psychological state of development characterized by: self-efficacy, optimism, hope, and resilience" (Luthans, Youssef, & Avolio, 2007). Leaders can influence employee psychological capital in multiple ways. Leaders have an effect on the four sources of efficacy identified by Bandura (1997, 2001): mastery experiences, vicarious learning, positive feedback, and psychological and physiological arousal (Luthans et al., 2007). A supervisor can break down a complex problem into simpler tasks, clearly define the roles and responsibilities of the employee and empower them to take job-related decisions thereby enhancing his/her chances of meeting success at work (Rego et al.,

2012). Participative goal-setting enhances the willingness and ability to design creative ways to achieve one's goals, that is, hope pathways (Luthans et al., 2007). Breaking down difficult goals into smaller, proximate and thus more manageable milestones can also enhance hope in employees. Optimism has been shown to be amenable to development through Schneider's (2001) three-step process, which includes leniency for the past, appreciation for the present, and opportunity seeing for the future (Avey, Luthans, & Jensens, 2009). By providing positive feedback to the subordinates and expressing confidence in their abilities, supervisors can motivate the employees to look at brighter side of things, redirect their perspective away from the negatives and focus on the positives and opportunities available. By exhibiting acceptance of failure, supervisors can indicate to the employees that failure is accepted at workplace, thereby enhancing their resilience (Luthans et al., 2007).

Psychological capacities can positively influence employee exhibition of creative performance behaviors. Self-efficacy beliefs nourish perceptions of self-competence (Bandura, 1997; Deci & Ryan, 2000). Employees high on efficacy display (and continue to display) work effort even when faced with difficult situations. Individuals with higher levels of hope have the agentic capacity to set and pursue goals in such a way that they stay motivated throughout the pursuant process (Avey, Patera, & West, 2006). Optimistic individuals form an expectancy perspective and expect good things to happen to them leading to significant cognitive and behavioral implications (Carver & Scheier, 2003). Given the external attribution of negative events, when faced with negative outcome, optimistic individuals will likely attribute the failure to external causes or to individuals around them and avoid reduction in their effort (Seligman, 1998). Resilient individuals have a firm acceptance of reality, a deep belief, often buttressed by strongly held values, that life is meaningful, and an astounding ability to improvise and adapt to significant changes (Masten, 2001; Luthans et al., 2007). Thus, we hypothesize:

> *H3: R&D leader behaviors (a: task-oriented; b: recognizing and inspiring; c: team building and developing; d: empowering; and e: leading-by-example) will be positively related to psychological capital (a: hope; b: optimism; c: self-efficacy; and d: resilience).*

H4: Psychological capital (a: hope; b: optimism; c: self-efficacy; and d: resilience) will be positively related to creative performance behaviors (a: idea development behavior; b: work engagement).

Leadership, Justice Perceptions and Creative Performance Behaviors

Organizational justice construct is considered to comprise of three broad dimensions, namely, distributive justice, procedural justice and interactional justice (Colquitt, 2001). Justice perceptions play an important role in influencing an employee's outlook towards the organization and its management. Research on distributive justice indicates that in order to be perceived as fair, the leader must strengthen the employee's instrumentality beliefs by making sure that employees have well defined beliefs about what outcomes they may expect to receive for the work they do (Colquitt, Conlon, Wesson, Porter, & Ng, 2001). Participative behavior leads to perceptions of procedural justice (Ehrhart, 2004; Yukl, 2008). Leaders allowing subordinates voice in decision-making processes, supporting them for thinking on their own, and treating them equitably can influence perceptions of procedural justice in subordinates (Pillai, Schriesheim & Williams, 1999). Perceptions of interpersonal justice result when leaders treat subordinates with respect and dignity and do not hide things from them (i.e. maintain open communications) (Khazanchi & Masterson, 2011; Scandura, 1999). Leader control strategies that seem akin to punishing behavior negatively predict interpersonal fairness (Gavin, Green, & Fairhurst, 1995). Leader's contingent reward behavior is associated with higher distributive, procedural, and interpersonal fairness (Van Knippenberg, De Cremer, & Van Knippenberg, 2007).

To date, only limited research attention has been given to the role of employees' perceptions of fairness as an antecedent to creativity (George & Zhou, 2007; Khazanchi & Masterson; Simmons, 2011). George and Zhou (2007) and Khazanchi and Masterson (2011) tested the relationship only between interactional justice perceptions and employee creativity. There have been no field studies testing the relationship between procedural, distributive and overall justice perceptions on employee creativity. When employees experience events characterized by high levels of fairness, they perceive control over the outcomes (instrumental model of justice – Tyler, 1987) and feel the need to reciprocate that treatment by engaging in activities that are likely to

contribute to better individual and organizational performance (Moorman, Blakely, & Niehoff, 1998; Simmons, 2011; Tyler & de Cremer, 2005; Walumbwa, Cropanzano, & Hartnell, 2009). According to the social exchange theory, equity, procedural fairness and high-quality relationships engender employees to engage in extra effort even without the prospect of an immediate and reciprocal 'pay back' (Blau, 1964). Consequently, fairly treated employees tend to demonstrate higher job effort (Walumbwa et al., 2009) and willing cooperation (Tyler & de Cremer, 2005) that transcend the requirements of formal contract (Pillai et al., 1999; Settoon, Bennett, & Liden, 1996).

Further, creativity necessitates taking risks. When employees are being creative, they are taking the risk of failure that is inherent in creative endeavors. Risk further comes into play in that even when an employee does come up with a new and useful idea, a certain level of uncertainty exists concerning whether the team and his/her supervisor will fairly evaluate the idea and will be open to the implement it (George & Zhou, 2007). Organizational justice perceptions likely contribute to employees' beliefs that it is safe to take such risks. In a fair work environment, employees may be willing to accept the risk of failure that accompanies creativity.

As suggested by the relational model of justice (Lind & Tyler, 1988), a fair procedure provides a sense of self-worth and identity and indicates a positive, full-status relationship with the authority figure (e.g., supervisor). Fair procedures followed to evaluate the idea may not only enhance risk-taking behaviors but also have a symbolic meaning in that employees are treated as ends rather than means (Pillai et al., 1999). Moreover, they will be confident that their idea will not be dismissed outright and will be given due attention. Thus, we hypothesize:

> *H5: R&D leader behaviors (a: task-oriented; b: recognizing and inspiring; c: team building and developing; d: empowering; and e: leading-by-example) will be positively related to justice perceptions (a: procedural; b: distributive; and c: interactional).*
> *H6: Justice perceptions (a: procedural; b: distributive; and c: interactional) will be positively related to creative performance behaviors (a: idea development behavior; and b: work engagement).*

Justice Perceptions, Autonomous Motivation and Psychological Capital Interrelationships

The three mediating variables (justice perceptions, autonomous motivation and psychological capital) do not exist independently. We hypothesize that they are interrelated and the development of one will lead to the development of another. A fairly treated individual feels positive affect (Chebat & Slusarczyk, 2005; De Cremer & Stouten, 2005; Weiss, Suckow, & Cropanzano, 1999) and is likely to evaluate a given task at hand as more enjoyable and is likely to persist longer on the task (Martin, Ward, Achee, & Wyer Jr., 1993; Zapata-Phelan, Colquitt, Scott, & Livingston, 2009). Given the research findings, we propose that one potential reaction to organizational justice is an increase in autonomous motivation. Thus, we hypothesize:

> *H7: Justice perceptions (a: procedural; b: distributive; and c: interactional) will be positively related to autonomous motivation.*

Psychological capacities are states rather than enduring traits, they can fluctuate over time, increasing or decreasing depending on the existing conditions. The way the decisions are formed and implemented may lead to formation of perceptions of organizational justice which, in turn, may lead to the enhancement of or deterioration of employee's psychological capital. For example, an employee who has been promoted to a more demanding job with unfamiliar and/or uncertain responsibilities will exhibit a drop in self-efficacy (Luthans et al., 2007). Thus, we hypothesize:

> *H8: Justice perceptions (a: procedural; b: distributive; and c: interactional) will be positively related to psychological capital (a: hope; b: optimism; c: self-efficacy; and d: resilience).*

In line with self determination theory's (Deci & Ryan, 2000; Ryan & Deci, 2000) propositions, an employee with perceived needs satisfaction is more likely to have positive evaluations about her abilities to succeed at a given task and is more likely to exhibit positive psychological capacities (Kovjanic, Schuh, Jonas, Van Quaquebeke, & Van Dick, 2012). When people are autonomously motivated, they experience greater mindfulness, greater vitality (i.e. energy available to the self), better psychological health, longer-term persistence, and greater volition or

a self-endorsement of their actions (Deci & Ryan, 2008). Deci, Connell and Ryan (1989) argued that supporting self-determination has a positive effect on an individual's self-esteem and perceived competence. Thus, we hypothesize:

H9: Autonomous motivation will be positively related to psychological capital (a: hope; b: optimism; c: self-efficacy; and d: resilience).

Creative Performance Behaviors and Creative Performance

As discussed earlier, in the present study creative performance behaviors have been argued to be an antecedent of creative performance. Creative employees are those who are able to both generate as well implement new ideas to produce creative outcomes. Employees who engage in creative behaviors are more likely to produce creative outcomes (Montag et al., 2012; Khazanchi & Masterson, 2011). This implies that creative behaviors should be linked to assessments of employees' creative performance. However, to date, creativity research has not empirically examined the influence of employees' creative behaviors on their objective creative performance. We, thus, hypothesize:

H10: Creative performance behaviors (a: idea development behavior; and b: work engagement) will be positively related to creative performance.

METHOD

Sample and Data Collection

The research study was conducted in 11 R&D laboratories of India's largest civilian research organization. These laboratories were involved in research and development activities in biological, chemical, physical and engineering sciences. Data were collected using a survey questionnaire that was administered to the scientists working in the research labs. One of the researchers went and stayed at each of the labs for a period of 1 week. Survey was distributed to all the scientists present during the period the researcher visited the laboratories. Anonymity of responses was ensured as the respondents were not asked to write their names or any other identifiable information. Each respondent was given a blank envelope to return the filled in form to the researcher. Four hundred and eighty two completely filled surveys were returned to the

researcher. All respondents had been associated with their supervisors for more than 2 years. Twenty-five percent of the respondents were females. Five percent of the respondents had a graduate degree, 33% had post-graduate qualification and 62% had a PhD degree. The average job tenure was 13.4 years. Forty-one percent of the respondents were junior level scientists, 39% were middle-level scientists, and 20% were senior-level scientists.

Measures

R&D-Specific Leader Behaviors

Leader behaviors were measured using the 39 item scale developed by Gupta et al. (2013). Scientists were asked to rate how frequently his/her supervisor exhibited the listed behaviors. The responses were measured using a 5-point Likert scale (1 = *not at all*, 5 = *great extent*). Model consisting of five first-order factors (task-oriented, recognizing and inspiring, team building and developing, empowering and leading-by-example) showed strong interrelationships between the first-order factors (average r = .78) suggesting the presence of a higher-order common factor (Kline, 2005). Another model was specified consisting of the first-order dimensions plus one second-order factor of R&D leadership. The model showed very good fit with the data ($\chi^2[682] = 1555.84$, $p < .01$; CFI = .99; IFI = .99; NNFI = .99; RMSEA = .05; SRMR = .04).

Justice Perceptions

Justice perceptions were measured using Colquitt's (2001) scale measuring procedural justice, distributive justice and interactional justice. Colquitt's justice perception scale has been tested in the Indian context (e.g. Gupta & Kumar, 2013; Khazanchi & Masterson, 2011) and was therefore considered to be appropriate to be used in this study. Based on the results of pilot test and informal interaction with scientists, it was observed that in the government R&D laboratories, the leaders had little influence on the informational aspect of justice. The information is conveyed using laboratory-wide memos and is fairly well communicated to all scientists. Moreover, the scientists usually cross check the information with their peers or the administrative staff to verify the content and authenticity of the information. We, therefore, dropped items measuring informational justice and retained only distributive, procedural and interpersonal justice items in the final questionnaire. The justice perceptions scale was given to

three experts (doctoral students and doctorate holders) to independently review the items and sort them according to the definitions of the intended dimensions. This reduced the number of items to 9 (3 items for each justice dimension). All items had good inter-rater reliability (.67 and above) and were judged to be reasonable indicators of the intended dimensions. The psychometric properties of the dimensions tested using the pilot sample were adequate (.80 and above). Sample item to measure distributive justice was "outcomes received are appropriate for the work I have completed". Sample item to measure procedural justice was "procedures followed in my organization uphold ethical and moral standards". Sample item to measure interpersonal justice included "I am treated in a polite manner during the procedures". The responses were measured using a 5-point Likert scale (1 = *not at all*, 5 = *great extent*). Three first-order factors consisting of distributive, procedural and interpersonal justices plus one second-order factor of organizational justice showed very good fit with the data ($\chi^2[10] = 16.13$; $p > .05$; CFI = .99; IFI = .99; NNFI = .99; RMSEA = .04; SRMR = .01).

Psychological Capital

The psychological capital scale developed by Luthans et al. (2007) has been tested in the Western context only. To the best of our knowledge, there exists no published study that had validated the scale in the Indian context. A new psychological capital scale was, therefore, developed for this study on the basis of the works of Tierney and Farmer (2002), Snyder et al. (1996), Wagnild and Young (1993) and Scheier and Carver (1985). Scales of Tierney and Farmer (2002), Snyder et al. (1996), Wagnild and Young (1993) and Scheier and Carver (1985) were administered to 30 professionals working in the high-tech organizations in India who were asked to read each item and provide their responses on whether the scale items represents the respective dimension. Items that were marked similarly and that matched the conceptual definitions of the constructs were included to form a set of 20 items. Next, to prune the item set further, the set of items was given to three experts (doctoral students and doctorate holders) to independently review the items and sort them according to the definitions of the four intended dimensions. This reduced the number of items to 15. All 15 items had good inter-rater reliability (.67 and above) and were judged to be reasonable indicators of the four dimensions. Finally, a confirmatory factor analysis was performed to check for the fit of the scales with the survey data. Four first-order factors plus one second-order factor showed very good fit with the data ($\chi^2[58] =$

92.96, p < .01; CFI = .99; IFI = .99; NNFI = .99; RMSEA = .04; SRMR = .03). The responses were measured using a 5-point Likert scale (1 = *strongly disagree*, 5 = *strongly agree*). Sample item to measure hope included "I can think of many ways to reach my current work goals". Sample item to measure optimism included "I hardly ever expect things to go my way" (reverse-worded). Sample item to measure self-efficacy included "I feel that I am good at generating novel ideas." Sample item to measure resilience included "My belief in myself gets me though hard times."

Creative Performance Behaviors

Creative performance behaviors were measured using creative behavior scales from Zhang and Bartol (2010) and Ramamoorthy, Flood, Slattery and Sardessai (2005). Zhang and Bartol (2010) developed a scale to measure problem identification, information search and idea generation behaviors and tested their scale on a sample collected from a technology company in China. Ramamoorthy et al. (2005) scale includes behavior items measuring idea promotion behavior and has been tested on an Indian sample. The scales were, therefore, considered to be appropriate to be used in this study. Prior to using the measure, we had three experts (doctoral students and doctorate holders) independently review the items and sort them according to our definitions of the four intended dimensions (problem identification, information search, idea generation, idea promotion). All allocated the items to their intended dimensions (inter-rater reliabilities of .67 and more) and judged them to be reasonable indicators. Sample items included: "I spend considerable time trying to understand the nature of problem" (problem identification), "I consult a wide variety of information when solving a problem" (information search), "I engage in generating original solutions for problems" (idea generation), and "I mobilize support for innovative ideas" (idea promotion). The responses were measured using a 5-point Likert scale (1 = *never*, 5 = *very frequently*).

It was not feasible to have the leader rate employee creative behaviors since our methodology assured participant anonymity and there was no reasonable way to follow up and match individuals. Moreover, as suggested by researchers (Janssen, 2000; Shalley, Gilson & Blum, 2009), employees are best suited to self-report behaviors because they are the ones who are aware of the subtle things they do in their jobs that make them creative. Self-reported creative

behavior measures are not uncommon in the management literature (Axtell et al., 2000; Shalley et al., 2009; Ng, Feldman, & Lam, 2010) and have been found to converge with supervisory ratings and with objective measures of behaviors in the workplace (Axtell et al., 2000; Ng et al., 2010; Ng & Feldman, 2012). The data found support for a four first-order and one second order-factor model ($\chi^2[46] = 78.86$, $p < .01$; CFI = .99; IFI = .99; NNFI = .99; RMSEA = .04; SRMR = .03). The second order factor was labeled as *idea development behavior.*

Work engagement was measured using Utrecht Work Engagement Scale (UWES)-9 developed by Schaufeli et al. (2006). The UWES has been validated in several countries of Europe, North America, Africa, Asia, and Australia (Bakker, 2010; Gupta & Kumar, 2013) and was thus considered to be appropriate to be used in the present study. Sample items included "At my job, I feel strong and vigorous" (vigor), "When I am working, I lose track of time" (absorption), and "My job inspires me" (dedication). The responses were measured using a 5-point Likert scale (1 = *never*, 5 = *very frequently*). Three first-order factors plus one second-order factor showed very good fit with the data ($\chi^2[17] = 27.85$, $p > .01$; CFI = .99; IFI = .99; NNFI = .99; RMSEA = .04; SRMR = .02).

Autonomous Motivation

Autonomous motivation was measured using a 6 item scale adapted from Tremblay, Blanchard, Taylor, Pelletier, & Villeneuve (2009). Sample items included "I am involved in my work because I derive much pleasure from learning new things" and "I am involved in my work because this work provides me a meaning for my life". The responses were measured using a 5-point Likert scale (1 = *strongly disagree*, 5 = *strongly agree*). One factor model showed very good fit with the data ($\chi^2[8] = 23.35$, $p > .01$; CFI = .99; IFI = .99; NNFI = .98; RMSEA = .06; SRMR = .03).

Creative Performance

The indicators were identified based on a review of literature (Oldham & Cummings, 1996; Dewett, 2007; Tierney et al., 1999) and the interviews conducted with scientists working in the R&D laboratories surveyed. Scientists were asked to report the number of papers published in peer-reviewed journals, cumulative impact factor, the number of conference papers presented,

patents filed and awarded (international and national) and book chapters written in the last three years. The scientists agreed that the objective measures identified were indicative of both novelty and usefulness aspects of creativity.

Control Variables

Scientists age, gender, education, job tenure and job level were modeled as control variables in the study. Age was measured as a continuous variable. Gender was modeled as an ordinal variable. Education was measured as a categorical variable. Graduates were assigned a code of 2, post-graduates were assigned a code of 1, and PhDs were assigned a code of 0. Employee job tenure was measured as years in service and was modeled as a continuous variable. Job level was measured as a categorical variable. Junior-level scientists were assigned a code of 2, middle-level scientists were assigned a code of 1 and senior-level scientists were assigned a code of 0.

Procedure

Confirmatory Factor Analysis (CFA) was used to check for the discriminant and convergent validity of the constructs using LISREL 8.52 (Jöreskog & Sörbom, 1993). Anderson and Gerbing's (1988) comprehensive, two-step analytical strategy was adopted to test the hypothesized model. The measurement model was first confirmed using confirmatory factor analysis (CFA) and we then performed SEM based on the measurement model to estimate the relationships between the constructs. To assess model fit in SEM, we reported the overall model chi-square measure, Comparative Fit Index (CFI), Incremental Fit Index (IFI), Non-Normed Fit Index (NNFI), Standardised Root Mean Square Residual (SRMR) and Root Mean Square Error of Approximation (RMSEA) (Hooper, Coughlan, & Mullen, 2008; Hu & Betler, 1999). Relative χ^2 (χ^2/df) less than 3, RMSEA less than .08, CFI greater than .95, IFI greater than .95, NNFI greater than .95 and SRMR less than .05 were taken as acceptable threshold levels (Hooper et al., 2008; Hu & Bentler, 1999). We averaged items into dimensions for leader behaviors, organizational justice, psychological capital, autonomous motivation, creative performance behaviors and treated the dimensions as indicators of their corresponding construct.

Hierarchical regression analysis was used to examine the relationship between creative performance behaviors and creative performance. Creative performance is count data

representing the number of times some event has occurred during a given time period. Moreover, performance data are positively skewed. Skewness and restrictions of range associated with event counts result in a high degree of non-normality (Cameron & Trivedi, 1998). Ordinary Least Squares (OLS) technique is inappropriate to assess relationships in such instances. As an alternative to OLS regression, we utilized regression analysis within the generalized linear model that allows unbiased maximum likelihood estimation of regression models with response variables from any member of an exponential family of distributions (Tierney et al., 1999). Generalized linear regression models for creative performance were estimated using SPSS 16.0 relying on the negative binomial regression with a logarithmic link function. The negative binomial regression is a more relaxed variant of Poisson regression and can be considered as a generalization of Poisson regression since it has the same mean structure as Poisson regression and has an extra parameter to model the over-dispersion. The regression model expresses the natural logarithm of the event or outcome of interest as a linear function of a set of predictors. For example, an increase of 1 in positive leadership has a multiplicative effect of increases the expected creative performance by exp(1) (or 2.72 times). The regression model is nonlinear, so there is no sum of squares upon which to base an estimate of *R squared*. We used other estimates of model fit that are available. The first is the likelihood ratio statistic that compares a given model to a constrained model such as a null model in which all slope coefficients are equal to 0 (Tierney et al., 1999). The difference between the two models is distributed as chi-square. This technique can be used to estimate the significance of adding additional parameters to the model analogous to the significance of incremental *R* squared in hierarchical regression. Another measure of the goodness of fit of the Poisson regression model is obtained by using the deviance statistic of a base-line model against a fuller model. A value close to 1 implies a good fit of the regression model (Cameron & Trivedi, 1998).

RESULTS

Discriminant and Convergent Validity

Confirmatory Factor Analysis (CFA) was used to check for the discriminant and convergent validity of constructs in the measurement model (Anderson & Gerbing, 1988). A significantly lower χ^2 value for the model in which the correlations are not constrained to unity would indicate that the constructs are not perfectly correlated and that discriminant validity is achieved.

Measurement model consisting of leader behaviors, justice perceptions, work motivation, psychological capital, and creative performance behavior as separate factors showed very good fit with the data (χ^2[249] = 498.80, $p < .01$; CFI = .98; IFI = .98; NNFI = .98; RMSEA = .05; SRMR = .04). All indicators exhibited significant ($p < .01$) relationships with their intended latent constructs. The second model (with all inter-construct correlations constrained to 1 showed fit (χ^2[264] = 785.90, $p < .01$; CFI = .94; IFI = .94; NNFI = .93; RMSEA = .06; SRMR = .47) that was significantly poor ($\Delta\chi^2$[Δdf] = 287.10[15], $p < .001$) than the first model.

Additionally, we tested other models to ensure that the self-report criterion were discriminable from the predictors. We combined idea development behavior, work engagement, justice perceptions, psychological capital and autonomous motivation into one construct and recalculated the fit indices. The model yielded poor fit statistics (χ^2[283] = 2139.87; CFI = .89; IFI = .89; NNFI = .88; RMSEA = .12; SRMR = .09) as compared to the original measurement model ($\Delta\chi^2$[df] = 1641.07[34], $p < .001$). Next, we conducted CFA to measure discriminant validities of mediating variables. For the mediating variables, the three-construct (autonomous motivation, justice perceptions, psychological capital) model showed significantly better fit than the single-construct model ($\Delta\chi^2$[df] = 1279.47[19], $p < .001$). Finally, we loaded the items of all constructs onto a common (method) factor. The fit of the model was significantly poor than the original measurement model ($\Delta\chi^2$[df] = 4164.74[40], $p < .001$).

Table 1. Descriptive Statistics and Correlations

	α[a]	CR[b]	M	SD	1	2	3	4	5	6	7	8	9	10	11
1. Age	--	--	44.6	17.1	--	--	--	--	--	--	--	--	--	--	--
2. Gender	--	--	.75	.43	.07	--	--	--	--	--	--	--	--	--	--
3. Education	--	--	1.57	.59	.28**	-.001	--	--	--	--	--	--	--	--	--
4. Tenure	--	--	13.4	10.5	.66**	.14**	.15**	--	--	--	--	--	--	--	--
5. Job Level	--	--	.79	.75	.48**	.14**	.45**	.55**	--	--	--	--	--	--	--
6. R&D Leadership	.92	.92	3.74	.75	-.03	-.03	-.03	.03	-.07	(.69)	.07	.08	.27	.08	.10
7. Autonomous Motivation	.85	.79	4.29	.58	.04	-.12**	.19**	.02	.11*	.27**	(.65)	.25	.06	.24	.42
8. Psychological Capital	.81	.82	4.17	.46	.12**	.01	.13**	.14**	.11**	.28**	.50**	(.54)	.11	.37	.36
9. Justice Perceptions	.90	.90	3.57	.90	.09*	-.03	.04	.20**	.10*	.52**	.25**	.33**	(.74)	.07	.14
10. Idea Development Behavior	.80	.81	4.00	.51	.04	.002	.07	.04	.04	.28**	.49**	.61**	.27**	(.53)	.36
11. Work Engagement	.84	.85	4.16	.59	.08	-.10*	.18**	.11*	.14**	.32**	.65**	.60**	.37**	.60**	(.65)

a. α: Cronbach Alpha Reliability; b. CR: Composite Reliability of the measurement model

Average Variance Extracted (AVE) for each construct (no. 6-11) is provided in parenthesis along the diagonal; Values below the diagonal are inter-construct correlations; Values above the diagonal (i.e. AVE) are square of correlations.

** p < .01(two-tailed); * p < .05 (two-tailed); N=482

Table 1 reports construct means, standard deviations, alphas, composite reliability, zero-order correlations and the Average Variance Extracted (AVE). AVE, reported in the parentheses along the diagonal, for all the constructs was greater than .5 indicating adequate convergent validity (Fornell & Larcker, 1981; Ping, 2005). Moreover, the squares of correlations between any two constructs (values above the diagonal in Table 1) were not greater than the individual AVEs of the two constructs suggesting that the constructs each have internal (extracted) variance greater than variance shared between the constructs and thus have adequate discriminant validity (Fornell & Larcker, 1981; Ping, 2005). Together, the results of Table 1 and the CFA runs allow us to rule out the threats associated with self-report criterion measures and indicate that the scales do possess adequate discriminant and convergent validity for use in hypotheses testing.

Hypotheses Testing

As noted above, the measurement model showed very good fit with the data (χ^2[249] = 498.80, p < .01; CFI = .98; IFI = .98; NNFI = .98; RMSEA = .05; SRMR = .04). Structural modeling

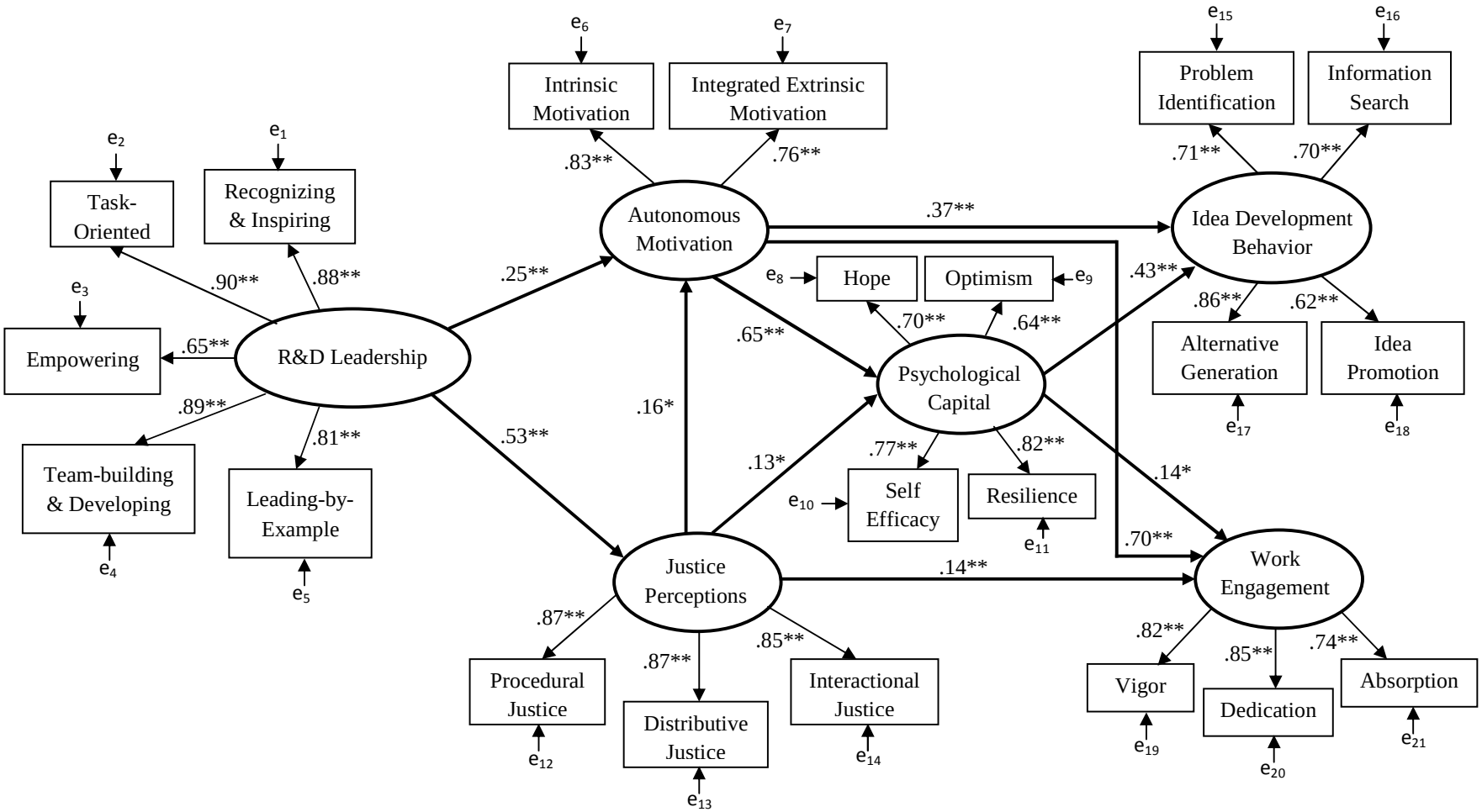
results showed that the hypothesized model fits the data very well ($\chi^2[250] = 502.77$, $p < .01$; CFI = .98; IFI = .98; NNFI = .98; RMSEA = .05; SRMR = .04).

Table 2. Significance Tests Results for Direct, Indirect and Total Effects as Reported by LISREL

Path	Total Effect		Direct Effect		Indirect Effect	
	B	β	B	β	B	B
1. R&D Leadership → OJ	.58**	.53**	.58**	.53**	NIP	NIP
2. R&D Leadership → AM	.19**	.34**	.14*	.25*	.05*	.09*
3. R&D Leadership → PSYCAP	.15**	.31**	.02	.02	.14**	.29**
4. R&D Leadership → IDB	.16**	.31**	.01	.03	.15**	.28**
5. R&D Leadership → ENG	.26**	.38**	.02	.03	.24**	.35**
6. OJ → AM	.09*	.16*	.09*	.16*	NIP	NIP
7. OJ → PSYCAP	.10**	.24**	.05**	.13**	.05*	.11*
8. OJ → IDB	.10**	.21**	.02	.05	.08**	.16**
9. OJ → ENG	.18**	.29**	.09**	.14**	.09**	.15**
10. AM → PSYCAP	.54**	.65**	.54**	.65**	NIP	NIP
11. AM → IDB	.59**	.65**	.33**	.37**	.26**	.28**
12. AM → ENG	.94**	.79**	.83**	.70**	.11*	.09*
13. PSYCAP → IDB	.47**	.43**	.47**	.43**	NIP	NIP
14. PSYCAP → ENG	.20*	.14**	.20**	.14**	NIP	NIP

Creative Performance Behaviors
IDB – Idea Development Behavior; ENG – Work Engagement
Mediator Variables
OJ – Organizational justice; PSYCAP – Psychological capital; AM – Autonomous motivation
NIP - No Indirect Path; B – Unstandardized Effect; β – Standardized Effect
**p < .01; *p < .05

Figure 2. Structural Equation Model with Standardized Path Coefficients



N = 482. Control variables (Age, Gender, Tenure, Education and Job Level) are not shown for ease of presentation. **p < .01, *p < .05.

Figure 2 presents the structural model with standardized path coefficients. The tests of significance of direct, indirect and total effects were performed using LISREL and the results are provided in Table 2. Table 2 shows significant direct relationship between leadership and justice perceptions, and between leadership and autonomous motivation. Leadership had significant indirect effects on psychological capital, idea development behavior and work engagement. The direct and indirect effects of mediator variables were also significant providing further support for the model shown in figure 2.

From the SEM results of figure 2, we see that leader behaviors were related to idea development behavior and to work engagement through justice perceptions, psychological capital and autonomous motivation. Table 2 shows that leadership had significant total effect on idea development behaviors ($\beta = .31$, $p < .01$) and work engagement ($\beta = .38$, $p < .01$).Leadership had a significant direct relationship with autonomous motivation ($\beta = .34$, $p < .01$). Autonomous motivation was positively associated with idea development behavior ($\beta = .37$, $p < .01$) and with work engagement ($\beta = .70$, $p < .01$). The results, thus, provided support for hypotheses 1 and 2. Table 2 shows that leadership had a significant total effect ($\beta = .31$, $p < .01$) on psychological capital. Almost all of this effect on psychological capital was accounted for by autonomous motivation and justice perceptions. Psychological capital was positively related to idea development behavior ($\beta = .43$, $p < .01$) and to work engagement ($\beta = .14$, $p < .01$). Thus, the results provided partial support for hypothesis 3 and full support for hypothesis 4. Leadership was significantly related to justice perceptions ($\beta = .53$, $p < .01$) and justice perceptions were related to idea development behavior ($\beta = .21$, $p < .01$) and work engagement ($\beta = .29$, $p < .01$). Almost all of the effect of justice perceptions on idea development behavior was through psychological capital and autonomous motivation ($\beta = .16$, $p < .01$). Justice perceptions had a direct effect ($\beta = .14$, $p < .01$) and an indirect effect through psychological capital ($\beta = .15$, $p < .01$) on work engagement. Thus, the data provided full support for hypothesis 5 and partial support for hypothesis 6. Justice perceptions were positively related to autonomous motivation ($\beta = .16$, $p < .05$) and to psychological capital ($\beta = .13$, $p < .01$). Autonomous motivation was positively related to psychological capital ($\beta = .65$, $p < .01$). Thus, the study results found support for hypotheses 7, 8 and 9.

Following Anderson and Gerbing's (1988) suggestions, alternative models were also examined that were less likely to fit the data but were nevertheless plausible. Table 3 provides a summary of model fit indices. The results show that amongst all the alternative models, there is no model that excels the hypothesized structural model in terms of fit with the data. The hypothesized structural model was the best fitting model amongst all alternate models, thereby, providing strong support for the directionality of the relationships proposed.

Table 3. Summary of Fit Indices of Alternate Models

Alternate Models	$\chi 2$	df	$\Delta\chi 2[\Delta df]^a$	RMSEA	CFI	IFI	NNFI	SRMR
1. Measurement Model	498.80	249		.05	.98	.98	.98	.04
2. Hypothesized Structural Model	502.77	250	--	.05	.98	.98	.98	.04
3. No direct paths from OJ to IDB, ENG	512.76	252	9.99[2]**	.05	.98	.98	.98	.04
4. No direct paths from PSYCAP to IDB, ENG	524.59	252	21.82[2]**	.05	.98	.98	.98	.04
5. No direct paths from AM to IDB, ENG	528.15	252	25.38[2]**	.05	.98	.98	.98	.04
6. No direct paths from OJ to PSYCAP, AM	516.54	252	13.77[2]**	.05	.98	.98	.98	.04
7. Direct path from PSYCAP to AM	502.77	250	0[0]	.05	.98	.98	.98	.04
8. Direct path from PSYCAP, AM to OJ	502.77	250	0[0]	.05	.98	.98	.98	.04

a - $\Delta\chi^2$ tests relative to the hypothesized structural model (model 2)

IDB – Idea Development Behavior; ENG – Engagement; AM – Autonomous Motivation, OJ – Organizational Justice perceptions; PSYCAP – Psychological Capital

**p < .01

Table 4. Results of Negative Binomial Regression of Creative Performance on Leadership and Creative Performance Behaviors

		Papers		Cum. Impact Factor		Patents Awarded		Conference Papers		Book Chapters	
		Step1	**Step2**	**Step1**	**Step2**	**Step1**	**Step2**	**Step1**	**Step2**	**Step1**	**Step2**
Control Variables	**Age (years)**	-.01	-.01	-.003	-.002	.005	.005	-.012*	-.014*	-.03	-.04
	Gender	-.02	.02	-.08	-.06	-.14	-.14	.11	.17	.70**	.77**
	Edu Dum 0	-2.26**	-2.21**	-2.96**	-2.84**	.001	.001	-.88**	-.80**	-2.34**	-2.26**
	Edu Dum 1	-1.31**	-1.29**	-1.90**	-1.89**	-1.31**	-1.29**	-.54**	-.48**	-1.82**	-1.80**
	Job Tenure (years)	.005	.004	-.01	-.02*	.025*	.024*	.003	.001	.01	.01
	Job Lvl Dum 0	-.73**	-.75**	-.59**	-.64**	-.42**	-.38**	-.93**	-.90**	-1.16**	-1.08**
	Job Lvl Dum 1	-.32**	-.34*	-.06	-.16	.13	.10	-.34*	-.38*	-.72**	-.74*
Predictors	**R&D Leadership**		.05		.04		-.04		-.04		-.17
	Idea Development Behavior		-.15		.23**		-.09		-.09		.01
	Work Engagement		.20***		.08		.42*		.40**		.47*
Fit Statistics	**ΔLR**	252.04**	5.41	426.34**	13.14**	160.24**	7.72*	98.12**	15.81**	99.74**	8.22*
	Deviance/df	1.08	1.07	2.37	2.36	1.36	1.35	1.34	1.30	.76	.75

1. Unstandardized coefficients (B) are reported. Age, Gender, Education (Edu Dum 0, Edu Dum 1), Job Tenure, and Job Level (Job Lvl Dum 0, Job Lvl Dum 1) entered in Step 1. R&D Leadership, Idea Development Behavior and Engagement entered in step 2.
2. (Edu Dum 0, Edu Dum 1) – (1,0): Graduation; (0,1) – Post-graduation; (0,0) – Ph.D.
3. (Job Lvl Dum 0, Job Lvl Dum 1) – (1,0): Junior level scientists; (0,1): Middle level scientist; (0,0): Senior level scientist
4. Gender: 1 – male; 0 – female

N = 482; **p < .01, *p < .05, ***p < .1

Creative Performance Behaviors and Creative Performance

The relationships between creative performance behaviors and scientists' creative performance were analyzed using negative binomial regression using a logarithmic link function. Creative performance of scientists was measured through self-reports of their research output: papers written in peer-reviewed journals, cumulative impact factor, papers presented in conferences, patents filed and awarded and book chapters written. We modeled cumulative impact factor as a count variable by rounding it off to the nearest integer. This enabled us to take care of the skewness that is inherent in the performance data. Each of the performance measure was regressed over control variables, leadership, idea development behavior and work engagement. The results of the regressions are provided in table 4.

Work engagement was significantly related to papers published ($\beta = .20$, $p < .1$), conference papers presented ($\beta = .42$, $p < .01$), patents filed and awarded ($\beta = .40$, $p < .01$) and book chapters written ($\beta = .47$, $p < .05$). Idea development behavior was significantly related to cumulative impact factor ($\beta = .23$, $p < .01$) only. The results provided support for a relationship between work engagement and creative performance. Scientist education and job level were other significant determinants of performance. Scientists who had PhD degrees were more likely to produce more creative output. Also, scientists who were higher up in the job level (senior or middle level positions) were more likely to produce creative outcomes.

The full model of the regression equation for a performance variable (e.g. cumulative impact factor) can be written as follows:

$$\mathbf{Log_e\,(Cumulative\ IF) = \beta_0 + \beta_1 Age + \beta_2 Gender + \beta_4 EduDum0 + \beta_5 EduDum1 + \beta_6 JobTenure + \beta_7 JobLvlDum0 + \beta_8 JobLvlDum1 + \beta_9 Leadership + \beta_{10} IdeaDevBeh + \beta_{11} Engagement}$$

On substituting the values from table 4, we have:

$$\mathbf{Log_e\,(Cumulative\ IF) = -3.081 - .002 Age - .06 Gender - 2.84 EduDum0 - 1.89 EduDum1 - .02 JobTenure - .64 JobLvlDum1 - .16 JobLvlDum1 + .04 Leadership + .23 IdeaDevBeh + .08 Engagement}$$

Taking antilog both sides, we get:

$$\textbf{Cumulative IF} = (e)^{-3.081} \times (e)^{-.002Age} \times (e)^{-.06Gender} \times (e)^{-2.84EduDum0} \times (e)^{-1.89EduDum1} \times (e)^{-.02JobTenure} \times (e)^{-.64JobLvlDum1} \times (e)^{-.16JobLvlDum1} \times (e)^{.04Leadership} \times (e)^{.23IdeaDevBeh} \times (e)^{.08Engagement}$$

Scientists having a graduate degree reported a cumulative impact factor exp(-2.84) (≈17.12) times less than those having a PhD degree. Scientists having a post-graduate degree reported a cumulative impact factor exp(-1.89) (≈6.62) times less than those having PhD degree. Junior scientists have cumulative impact factor exp(-.64) (≈1.89) times less than senior level scientists, while middle level scientists have cumulative impact factor exp(-.14) (≈1.17) less than senior level scientists. Scientists exhibiting greater idea development behavior have cumulative impact factor exp(.23) (≈1.26) times higher cumulative impact factor. Arguing in similar vein, scientists higher on work engagement report greater number of papers in peer-reviewed journals (exp(.20) ≈ 1.22 times), greater number of patents (exp(.42) ≈ 1.53 times), greater number of conference papers (exp(.40) ≈ 1.49 times) and higher number of book chapters written (exp(0.47) ≈ 1.60 times). The results provide partial support for hypothesis 10 as a consistent positive relationship was reported only between work engagement and creative performance.

DISCUSSION

Theoretical Contributions

The study makes contributions to leadership and creativity literatures. First, the study provides evidence of criterion-related validity of R&D-specific leader behaviors that may be important in a R&D context but are not included in the popular leadership taxonomies. Such evidence on the criterion-related validity of the measure lends further support to the claim by leadership researchers (e.g. Arnold et al., 2000; Khatri, 2005; Palrecha et al., 2012; Yukl, 1999, 2008) that it is necessary to identify and choose carefully the leader behaviors that may be most appropriate for a given research setting. The study found support for calling the set of task-oriented, recognizing, inspiring, team-building, developing, empowering and leading by example behaviors as 'positive R&D-specific leader behaviors'.

Second, the present study has demonstrated that leader behaviors like task-oriented, empowering, leading by example and team building may be important in the Indian cultural context and are positively related to employee creativity. Indians are highly status conscious and are dependence prone. They seek directions, assistance, and attention even in situations where they are capable of functioning on their own (Erez & Nouri, 2010; Sinha, 2008). Leading by example is, therefore, a very important behavior in the Indian context. By monitoring the progress of the work regularly and suggesting corrective actions mid-way, leaders can sustain the involvement of the juniors in their work and are more likely to enhance their self-efficacy and engagement. India is a collectivist society. Every individual in India is linked to the rest of social body by a network of diversified ties. By emphasizing 'teamwork' leaders can increase the frequency of interactions between team members. Increased interactions may lead to a greater understanding of the problem and lead to creative solutions to the problem. Leaders, who ensure that there is good will and only low-to-moderate level of conflict between team members, may lead to improving team's creative performance (Farh, Lee, & Farh, 2010). Today, national cultures are no longer "black boxes" but are becoming increasingly transparent, fluid, elastic, eclectic, virtual, and mobile (Fang, 2010). India of today is increasingly getting exposed to the ideals of western societies. This has led to the development of a broader world view where the younger, educated employees of today nourish Western values of achievement, advancement and ability utilization. Such employees generally crave for greater autonomy and responsibility to work on their own. 'Empowering' behavior is another important behavior in the Indian context.

Third, the study demonstrates relationships between leadership, employee autonomous motivation, and justice perceptions. Leaders can impact employee perceptual variables through the behaviors they exhibit. Leaders can affect autonomous motivation through the self-determination aspect of motivation. It is essential that they make effort to enhance the interesting and challenging aspects of work rather than emphasizing a carrot-and-stick type of performance management system. Setting high standards of performance and by becoming a role model, leaders can affect employee justice perceptions. Individuals in cohesive teams are less likely to

feel threatened by injustice, and are less likely to retaliate immediately even when they experience lower levels of fairness (Erdogan, Liden & Kraimer, 2006).

Fourth, the study contributes to creativity literature by examining and confirming the role of autonomous motivation, psychological capital and justice perceptions in influencing employee creative behaviors that, in turn, affect employee creative performance. While a few of these variables have been shown to be positively related to creative behaviors, there has been a felt need to test the specific connection between them and creative performance (Dewett, 2007; Montag et al., 2012). The present study is significant in this respect as it shows how these variables are interrelated and how they impact employee creative performance. These relationships between variables have not been demonstrated in the creativity literature so far.

Fifth, the study tested the relationships between employee creative performance and creative performance behaviors. There exists scant literature testing the effect of leadership on individual creative performance. Only a few studies (e.g. Dewett, 2007; Oldham & Cummings, 1996; Tierney et al., 1999) have documented the role of workplace variables on employee creative performance and the results have been inconclusive. The study shows that out of idea development behavior and work engagement, work engagement is positively related to all the measures of scientists' creative performance. Idea development behavior did not significantly predict four out of five measures of creative performance. Erez and Nouri (2010) developed a model linking cultural values to creative behaviors. The authors argued that while individualism emphasizes uniqueness, autonomy, independence, and self-initiative, collectivism emphasizes conformity to the group, consensus, and interdependence, all restraining the generation of unique ideas and self-expression. Also, employees of collectivist and high power distance cultures are not socialized to think independently. They are likely to conform to the existing rules and procedures set and respected by their superiors, rather than breaking the rules (Ishikawa, 2012). India, to a large extent, is still a collectivist and a high power distance society. Indians are more likely to conform to norms set by superiors. An employee is, therefore, less likely to engage in idea development behaviors and risk failure. She would rather continue to do the task given to

her routinely. The difference between a high performing and a low performing employee would be in the extent to which she is involved and passionate about her work (elements of work engagement). This difference in the levels of work engagement of such employees is much more likely to be visible, tangible and related to creative outcomes. This could be one possible explanation of this finding of the study. Future works should further explore this claim.

Finally, the present study contributes to the R&D management literature by testing the conceptualized model in an R&D setting. Examination of influence of leadership on R&D professional's performance has been inadequate and controversial. While some argue that leadership is redundant in a R&D setting, others contend that leadership is essential even in a R&D setting (Zheng et al., 2010). The present work has not only tested the relationship between leader behaviors and creative performance but has also suggested important mechanisms that explain this relationship in the R&D context.

Implications for Practice

The study has significant implications for practice. First, the study has explored the leadership characteristics necessary for effective management of people engaged in creative pursuits in R&D setting. The study found that leadership plays a role in encouraging employee creativity. Specifically, study results suggest that organizations should try to promote positive leader behaviors like task-oriented, empowering, recognizing, inspiring, team-building, developing and leading by example. Second, the framework tested here should provide insights to the management practitioners about how leaders can influence subordinate performance. The study reported a direct positive relationship between leader behaviors, justice perceptions and autonomous motivation that, in turn, are related to psychological capital, idea development behavior and work engagement. Psychological capital is also positively related to creative performance behaviors. Thus, the leaders should see to it that these psychological and perceptual variables are kept at high levels in the employees. Finally, the study has been conducted in the Indian R&D setting and should provide useful insights to the management of creativity of R&D professionals in India and other similar cultures.

Strengths, Limitations and Directions for Future Research

We were able to directly access a large sample of full-time professionals from R&D laboratories that are generally considered to be difficult to approach and gain access to. In addition, in designing our survey, we were aware of potential limitations associated with this methodology and took steps to minimize their seriousness by taking care of the ordering of items, incorporating controls and testing for discriminant and convergent validities of constructs.

Although the findings of this study are in line with the developed theory, the study has some limitations that can be addressed in future research. The research was cross-sectional, and so any inferences regarding causality are limited. However, we had strong theoretical and logical reasons to presume causal ordering, which was subsequently reflected in the statistical analysis. The data were self-reported and were collected at a single point in time. We made every attempt to minimize concerns of common method variance. In designing the survey, we were careful to adhere to the recommendations of Podsakoff, MacKenzie, Lee and Podsakoff (2003), in that we separated questions used in the study from each other to minimize this problem. Although we checked for the common method variance through procedural control (assuring respondents of anonymity of their responses) and statistical control (confirmatory factor analysis), the possibility of this error cannot be all together discounted. Future studies should test the relationship between leadership and creativity through other study designs, like longitudinal study, analysis of daily diary entries of scientists in order better understand the interrelationships between the constructs.

An interesting direction for future study might be to assess the extent to which these individual difference variables (e.g. role identity, personality, cognitive style, knowledge, etc) interact with aspects of leadership and creative behaviors to influence creative outcomes. For instance, it is possible that an individual with creativity-oriented personality (e.g., openness to experience) may be more willing to engage in idea promotion behaviors to produce the needed novel and useful outcomes. All data were collected within a single public sector organization, which limits the observed variability and decreases external validity. Of course, conducting this study in a single

organization did provide the advantage of controlling for potential organization-level confounding variables. Future research in multiple organizational settings may increase the generalizability of the findings to other types of employees and organizations.

CONCLUSION

Leaders play one of the most significant roles in encouraging employee creativity. The study presents a holistic model specifying linkages between leader behaviors, employee perceptual and psychological variables, behaviors and eventual creative performance. The ideas of positive psychology, organizational justice, and autonomous motivation have never been explored simultaneously as mediating mechanisms for the relationship between leadership and creative performance behaviors. Based on a detailed theory building followed by rigorous data analysis, this study yields specific suggestions for managers of employees whose job involves significant creative problem solving. We hope that the model will serve as a good starting point for researchers studying employee creative performance in different cultures and contexts.

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