LEADERSHIP, CREATIVE PROBLEM-SOLVING CAPACITY, AND CREATIVE PERFORMANCE: THE IMPORTANCE OF KNOWLEDGE SHARING

ABRAHAM CARMELI, ROY GELBARD, AND RONI REITER-PALMON

This article presents two studies that examine whether leader supportive behaviors facilitate knowledge sharing and employee creative problem-solving capacity, thereby enhancing creative performance. The findings from both studies indicate that leader supportive behaviors are directly and indirectly related, through both internal and external knowledge sharing, to employee creative problem-solving capacity. In addition, creative problem solving was related to the two dimensions of creative performance—fluency and originality. However, a test of the mediation model indicated that creative problem solving only mediated the relationship between internal knowledge sharing creative performance and originality. These findings highlight the complex process by which leaders facilitate both internal and external knowledge sharing and employee creative problem-solving capacity, thereby improving employee creative performance.

Keywords: creative problem-solving capacity, creativity, knowledge sharing, leadership

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Introduction

Organizations constantly seek ways to facilitate and enhance creative, innovative behaviors among their employees, and in gaining and sustaining a competitive edge in today's marketplace. This has led to abundant theoretical and empirical literature on what enables or hinders employee creativity in such fields as human resource management, psychology, sociology, and organization science (e.g., Amabile, Conti, Coon, Lazenby, & Herron, 1996; George, 2007; Hunter, Bedell, & Mumford, 2007; McCrae, 1987; Shipton, West, Dawson, Birdi, & Patterson, 2006).

Knowledge sharing is crucial because it enables people to capitalize on existing knowledge bases residing within and outside the organization, thus enhancing their capacity to come up with creative solutions, and enabling their organizations to develop new platforms for the development and introduction of new products and services to the market.

Intangible assets have become ever more critical for growth and success in a knowledge-based economy (Canals, 2000; Carmeli & Schaubroeck, 2005). Knowledge sources are fundamental building blocks in facilitating creativity and innovation in organizations, and enable them to create and appropriate value (Grant, 1996; Nonaka & Takeuchi, 1995; Wang & Noe, 2010). Hence, organizational leaders carefully attend to the need to facilitate knowledge-creation processes to enhance creativity and innovation (Collins & Smith, 2006). Specifically, researchers have pointed to the importance of knowledge sharing between members within, across, and outside the organization (Chowdhury, 2005) in enhancing the capacity of an organization to innovate and produce quality solutions quickly (Daellenbach & Davenport, 2004). Knowledge sharing is referred to as activities aimed at transferring or disseminating knowledge from one person or group to another (Lee, 2001). It is also important to note that the terms *knowledge sharing* and *information sharing* have been used interchangeably in previous work (Wang & Noe, 2010). However, our focus here is on (implicit or tacit) work experience that has been shared and exchanged between employees in the workplace.

Knowledge sharing is crucial because it enables people to capitalize on existing knowledge bases residing within and outside the organization, thus enhancing their capacity to come up with creative solutions, and enabling their organizations to develop new platforms for the development and introduction of new products and services to the market (Nonaka & Takeuchi, 1995; Wang & Noe, 2010). Conversely, when knowledge is not shared, it hinders the capacity to exploit experience and expertise (Hansen, 1999, 2002; Lu, Leung, & Koch, 2006). For instance, consulting firms such as Bain, BCG, and McKinsey have devoted considerable effort to developing mechanisms (e.g., face-to-face interactions, relational connections) to facilitate knowledge sharing as part of their "personalization" strategy. Other companies praise knowledge sharing in a move to cultivate more effective problem-solving processes. For example, the leadership at Ericsson attempted to build and elaborate employee technical skills through knowledge-sharing practices that involved projects often carried out by multiple offices.

A growing body of research has accumulated in recent years on managing knowledge resources in general (Hansen, 1999, 2002; Lu et al., 2006; Teece, 1998), and factors that facilitate knowledge sharing in particular (Davenport, DeLong, & Beers, 1998; Davenport & Prusak, 1998; Lu et al., 2006). However, relatively little is known about the role of leadership in facilitating employee knowledge sharing (Nonaka & Toyama, 2005), and enhancing employee creativity and innovation (Reiter-Palmon & Illies, 2004).

This study attempts to address these issues by examining the role of leadership in facilitating knowledge sharing and enhancing the creativity of employees in work organizations. Specifically, the current study examines a model that links leader

supportive behaviors (defined here as modeling collaboration and knowledge sharing and encouraging information exchange, openness, and idea sharing) to both internal and external knowledge sharing, and employees' creative problem-solving capacity and creative performance. In so doing, we hope to contribute to the literatures on creativity, knowledge sharing, and leadership.

Theoretical Background and Hypotheses

Creativity and Capacity for Creative Problem Solving

Creativity refers to as the production of new or novel ideas that are useful (Amabile, 1988) and entails change and behavior that defies the norm (Sternberg, 2006). Research on creativity in organizations and creativity in the workplace has sought to understand the antecedents and causes of creative performance of individuals and teams in organizations (George, 2007). At the individual level, cognitive elements, specifically creative problem-solving processes, or cognitive processes associated with creative problem solving (i.e., the ways individuals interpret and use knowledge to solve problems), have been evaluated in terms of their contribution to individual and team creativity in the workplace (Mumford & Hunter, 2005; Reiter-Palmon, Herman, & Yammarino, 2008).

Although related, there is a difference between creativity and creative problem solving. Creativity refers to the ideation process—namely, the generation of new ideas that are novel and useful. Thus, creative performance or creativity is defined in terms of generating new ideas (originality) that are appropriate (usefulness). Creative problem solving refers to core creative processes associated with the generation phase that includes identification and construction, information search and acquisition, and ideation, as well as the implementation phase, which includes idea evaluation, idea selection, and implementation planning (Reiter-Palmon & Illies, 2004).

The capacity for creative problem solving does not refer here to the process (we did not examine processes per se), but rather to the capacity or capability that can be cultivated and improved such that individuals are able to identify, construct, search, and acquire information, and generate ideas and evaluate, select, and implement them. In Study 1, we focused on capacity for creative problem solving, and in Study 2, we examine both capacity for creative problem solving and creative performance.

Cognitive processes are viewed as one of the most important factors that can facilitate creative problem solving (Amabile, 1996; Mumford, Mobley, Uhlman, Reiter-Palmon, & Doares, 1991). Models of cognitive processes of creativity typically identify multiple processes associated with creativity (Mumford et al., 1991). Of these processes, the information search and acquisition process remains poorly understood and has received relatively little research attention. However, Ward, Smith, and Vaid (1997) argued that without additional information, information search, and encoding, new ideas will resemble old ideas, resulting in less creativity. By contrast, the availability of diverse cues and diverse information results in increased creativity for the solutions generated (Illies & Reiter-Palmon, 2004; Reiter-Palmon, Mumford, O'Connor Boes, & Runco, 1997). Information can come from two sources: it can be internal, based on tacit knowledge and expertise the individual already possesses, or external, from other employees, social networks, or written sources, such as books, in which knowledge is explicit.

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Additional support for the importance of information or knowledge search

and acquisition, especially from external sources, comes from work on weak ties and their importance for creative problem solving. Weak ties are "social relationships that are typified by infrequent interaction, short history, and limited (emotional) closeness" (Baer, 2010, p. 592). Perry-Smith and Shalley (2003) suggested that weak ties should be related to creativity due to the breadth of connections and access to more diverse sources and non-redundant information. Empirical studies have supported this notion, finding that having more weak ties is related to creativity (Baer, 2010; Perry-Smith, 2006). While the availability of diverse information is important for creative problem solving, it is not sufficient. The advantage of diverse knowledge can only be capitalized upon if an individual is able to recognize the importance of the information and integrate it into current knowledge in a new way (Baer, 2010; Ward et al., 1997). For example, Carmeli and Azerual (2009) showed the importance of internal and external relational capital (i.e., quality interpersonal relationships manifested by relational trust) to knowledge combination and improved performance in a knowledge-intensive setting. In addition, searching for and acquiring information is only helpful if the new information is applicable to the problem at hand (Mumford, Baughman, Supinski, & Maher, 1996; Smith, 1989). Thus, deep or high-quality relationships manifested by relational trust, openness and generativity, emotion expression, and tensility may be critical, as they enable learning and knowledge exchange (Carmeli, Brueller, & Dutton, 2009; Levin & Cross, 2004), which are meaningful for creativity and innovation processes.

In this study, we focus on employee engagement in the core cognitive processes, as well as actual performance on a creativity task (Mumford et al., 1991; Reiter-Palmon & Illies, 2004). Previous research suggests that effective engagement in the processes of problem construction and identification, information search and acquisition, idea generation, idea evaluation, and implementation is critical for creativity (Mumford, Baughman, & Sager, 2003; Reiter-Palmon, Mumford, & Threlfall, 1998). Individuals who engage in these processes are more likely to develop creative solutions to problems, and creative individuals are more likely to engage in these processes (Mumford et al., 1991; Reiter-Palmon et al., 1998). We term the engagement in these core processes the "creative problem-solving capacity."

Leadership and Creativity

Research suggests that leadership is important for nurturing employee creativity (Mumford & Hunter, 2005; Woodman, Sawyer, & Griffin, 1993). However, it remains unclear exactly how leaders influence employee creativity. Previous research on the relationship between leadership and employee creativity has identified several mechanisms by which leaders can influence creativity such as providing structure, resources, and psychological conditions that help motivate employees to be involved in the creative process and exhibit creativity (Carmeli, Reiter-Palmon, & Ziv, 2010; Reiter-Palmon & Illies, 2004). In particular, research has shown that leaders can provide direction, structure, and guidance to subordinates, thus allowing for more successful creative problem solving (Redmond, Mumford, & Teach, 1993). Because creativity takes place when issues are novel and complex, often ill defined and poorly structured, leaders can set up expectations and direct the attention of followers to specific goals (or approaches) or facilitate the framing of the discussion and the problem at hand (Carmeli & Schaubroeck, 2007; Farris, 1972; Mumford, Byrne, & Shipman, 2009; Reiter-Palmon & Illies, 2004). Researchers also point out that leaders can promote creativity among followers by providing them with the resources they need for the creative task. Creativity requires time and effort, and leaders can help followers by procuring essential resources such as materials, funding, and access to information and knowledge (Reiter-Palmon & Illies, 2004). Given that creativity is such a complex process, research also points to the structuring and architecture of jobs, tasks, and processes as a useful

means to enhance creative behaviors (Binyamin & Carmeli, 2010; Goldenberg, Mazursky, & Solomon, 1999; Hackman & Oldham, 1980; Nelson & Winter, 1982; Ohly, Sonnentag, & Pluntke, 2006; Sagiv, Arieli, Goldenberg, & Goldschmidt, 2010).

In addition, recent works have noted the importance of leader supportive behaviors in facilitating employee creative production. Studies have shown that supportive leadership can facilitate employee creativity by creating the psychological conditions, cultivating quality relational exchanges and inducing positive energy, and providing constructive feedback (Atwater & Carmeli, 2009; Carmeli et al., 2010; George & Zhou, 2001). Other studies lend further support to this notion by suggesting that transformational leadership is a key to enhancing employee creativity (Jung, 2001; Shin & Zhou, 2007). Finally, researchers have noted the importance of building and nurturing a climate for creativity (Arad, Hanson, & Schneider, 1997; Hunter, Bedell, & Mumford, 2007; Mumford & Hunter, 2005).

Despite this growing body of research, many questions remain as to how leaders facilitate processes that can improve creative problem-solving capacities (Reiter-Palmon & Illies, 2004). The current article addresses some of these questions by examining the role that leaders play in facilitating knowledge sharing, which in turn can cultivate creative problem-solving capacity and creative performance. In what follows, we present the rationale for the link between leadership, knowledge sharing, and creative problem solving.

Knowledge Sharing and Creativity

An important factor that influences creativity and effective application of the creative cognitive processes is knowledge or expertise (Vincent, Decker, & Mumford, 2002; Weisberg, 1999). This emphasis on knowledge stems from the view that creativity does not occur in a vacuum. In order to develop an idea that is both novel and useful, individuals must have some degree of knowledge of the field in which they are working (Mumford & Hunter, 2005; Weisberg, 1999). Cognitive models of creativity suggest that information search and acquisition are important to creativity (Mumford et al., 1991).

However, there is only limited research on the role of knowledge acquisition in regard to creativity and cognitive processes associated with creativity. Studies typically focus on the role of expertise in enhancing creativity, postulating that it leads to internal knowledge search (e.g., Vincent et al., 2002). However, knowledge may be obtained from other sources. Knowledge management scholars have noted that knowledge-creation processes are central to innovation (Collins & Smith, 2006; Nonaka & Takeuchi, 1995). Paulus and colleagues documented the benefits of sharing ideas, and the need for group members to pay careful attention to shared ideas to enhance creativity (Paulus & Brown, 2007; Paulus & Coskun, 2013; Paulus, Nakui, & Putman, 2006).

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Studies that evaluated the role of knowledge and information sharing and creativity have found that both internal and external knowledge sharing led to increased creativity and innovation (Damanpour, 1991; Hulsheger, Anderson, & Salgado, 2009). For example, Ancona and Caldwell (1992) found that knowledge sharing with external sources was related to increased team innovation. Monge, Cozzens, and Contractor (1992), in a longitudinal study of five organizations, found that the level of communication within the organization and amount of information, which included knowledge sharing, were the best predictors of innovation over time. Troy, Szymanski, and Rajan (2001) found that a climate that emphasized open communication and knowledge sharing and the availability of market information interacted in predicting new product ideas. Specifically, both open communication and

availability of market information were necessary for idea generation.

These studies indicate the contribution of knowledge sharing to creativity and innovation. In particular, the availability and exchange of knowledge from both internal and external sources has been found to be important for individual and organizational creativity (Damanpour, 1991; Hulsheger et al., 2009; Weisberg, 1999). However, previous research on knowledge sharing has not evaluated its role and effect on engagement in the other cognitive processes of creativity.

Hypothesis 1a: Internal knowledge sharing is positively associated with creative problem-solving capacity.

Hypothesis 1b: External knowledge sharing is positively associated with creative problem-solving capacity.

Leadership and Creativity: The Mediating Role of Knowledge Sharing

Leadership and Knowledge Sharing

In recent years, a growing body of research on knowledge sharing in organizational settings has emerged. While many studies have focused on the role that technology plays in knowledge management (see Alavi & Tiwana, 2003), some research suggests that leaders play a critical role in knowledge management and knowledge sharing (Bryant, 2003; Carmeli, Atwater, & Levi, 2011; Carmeli & Waldman, 2010). Research evaluating the role that leaders play in knowledge management and knowledge sharing suggests that specific leadership styles such as transformational and empowering leadership result in more knowledge sharing (Carmeli et al., 2011; Srivastava, Bartol, & Locke, 2006). In addition, leaders may influence knowledge sharing indirectly through their influence on the norms and climate of the workgroup. Troy et al. (2001) found that a climate that emphasized open communication led to greater knowledge sharing. Similarly, Tjosvold, Yu, and Wu (2009) found that groups that had cooperative norms were more likely to share knowledge and develop better and more innovative solutions. Previous work suggests that leaders are instrumental in developing and cultivating work climates (Schneider, Ehrhart, Mayer, Saltz, & Miles-Jolly, 2005). Leaders can signal behaviorally and verbally the appropriate and normative behaviors that are expected from group members. For instance, researchers have noted the role of leaders in shaping a work context that is crucial for facilitating the socialization, externalization, combination, and internalization (SECI) process (Nonaka & Toyama, 2005; Nonaka, Toyama, & Konno, 2000). Others have found a more direct link between leader expectations, behaviors, and knowledge sharing, in particular that leader expectations and leader supportive behaviors cultivate a context of knowledge sharing and integration, which in turn enhances group performance (Carmeli & Waldman, 2010). Thus, we suggest that leaders who model knowledge sharing and collaborative behaviors and encourage information exchange, openness, and idea sharing are likely to motivate individuals to share and exchange knowledge with others within and outside the organization.

Hypothesis 2a: Leader behaviors are positively related to internal knowledge sharing.

Hypothesis 2b: Leader behaviors are positively related to external knowledge sharing.

The Mediating Role of Knowledge Sharing

As indicated, leaders can influence creativity in multiple ways by developing a climate conducive to creativity and innovation, by serving as a role model for innovation, and by providing support (Mumford & Hunter, 2005). We posit that leader supportive behaviors are keys to developing and shaping a context for knowledge sharing, which in turn nurtures capacities for creative problem solving. This is a critical mechanism by

which leaders in organizations shape a context of cooperation and structure the process of knowledge sharing that helps overcome resistance to knowledge sharing (Bartlett & Ghoshal, 1986; von Krogh, 2003). Leaders help to build, maintain, and facilitate a specific physical, time and space context ("*ba*") in which the participants interact and create new meanings, thus enabling the creation of new knowledge, which is vital for creativity and innovation (Nonaka & Toyama, 2005; Nonaka et al., 2000). Thus, we suggest that by facilitating knowledge sharing within and outside the organizations, leader supportive behaviors are a key to cultivating the capacity to solve problems creatively at work.

Hypothesis 3: Both modes of knowledge sharing (internal and external) mediate the relationship between leader behaviors and creative problem-solving capacity.

Study 1: Method

Sample and Procedure

Study 1 involved 350 full-time employees working in manufacturing (e.g., chemical and pharmaceutical) and non-manufacturing (e.g., finance and insurance) organizations. The sample was identified through personal connections of two of the authors with the organizations that participated in the study. We asked the directors of the organizations to identify employees who were engaged in knowledge creation at work (i.e., participants were involved in the development of new services, products, and technology). A list of 630 employees, who work in such units as R&D, business development, and engineering, served as our targeted research sample. However, due to requests of the manager to minimize the interference in the regular workday, we asked 350 employees to participate and complete a structured questionnaire. The surveys were administered to respondents and collected during our prescheduled visits in these units. In a cover letter each respondent received, we briefly indicated that the study was aimed at learning about employees' perceptions of organizational knowledge. Participants were assured confidentiality.

We received 274 usable surveys, representing a response rate of 78.28 percent. The respondents' average age was 37.92 years (SD = 10.12), and their average tenure in the organization was 10.42 years (SD = 8.68). Thirty-eight percent of the respondents were female. A total of 26.7 percent had a high school diploma, 44.8 percent had a BA degree, and the remaining 28.5 percent had an MA degree or above.

Measures

All measurement items are shown in the Appendix.

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Creative Problem-Solving Capacity

Based on the Reiter-Palmon and Illies (2004) conceptualization, a measure was developed for this study. The measure included eight items, with two items measuring each of the four main processes: problem construction and identification, idea generation, idea evaluation, and idea implementation. To validate the scale, we first asked five graduate students to indicate the extent to which each item reflected each one of the four dimensions of creative problem solving. We then tested the scale using a short survey administered to 40 graduate students who had participated in an elective course in management. Respondents were asked to indicate on a five-point scale (ranging from 1 = not at all to 5 = to a large extent) the extent to which they possessed capabilities to solve problems creatively using the following four dimensions: problem identification and construction, idea generation, idea evaluation, and implementation. Results of an exploratory factor analysis, which are shown in the Appendix, indicate that all eight items loaded onto one factor with an eigenvalue of

5.62 and explained 70.29 percent of the variability. The Cronbach's alpha obtained in the pilot study for this measure was .94.

Knowledge Sharing

Following previous research (e.g., Lee, 2001; Lu et al., 2006), eight items were used to assess the extent to which employees exchange knowledge with colleagues inside and outside their organization. Respondents were asked to indicate on a five-point scale (ranging from 1 = not at all to 5 = to a large extent) the extent to which they exchange knowledge with both their colleagues inside the organization (i.e., internal knowledge sharing) and people outside the organization (i.e., external knowledge sharing). Results of an exploratory factor analysis, which are shown in the Appendix, indicate that the eight items loaded onto two factors (four items per factor). One factor, internal knowledge sharing, had an eigenvalue of 4.61 and explained 37.66 percent of the variability. The second factor, external knowledge sharing, had an eigenvalue of 1.37 and explained an additional 37.17 percent of the variability. Together, these two factors explained 74.83 percent of the variance. The Cronbach's alphas for internal and external knowledge sharing measures were .87 and .89, respectively.

Leader Behavior

Following previous studies on leadership and knowledge exchange or sharing (e.g., Carmeli & Waldman, 2010; Connelly & Kelloway, 2003), we constructed four items to assess the extent to which employees believe their manager supports and encourages knowledge exchange. Responses were on a five-point scale (ranging from 1 = not at all to 5 = to a large extent). Results of an exploratory factor analysis, which are shown in the Appendix, indicate that all four items loaded onto one factor with an eigenvalue of 2.76 and explained 69.14 percent of the variability. The Cronbach's alpha for this measure was .85.

Control Variables

We controlled for respondent gender, age, tenure in the organization, and educational level to test whether they accounted for some of the variance in creative problem solving. We also controlled for organization effects by creating a dummy variable of organization type (manufacturing vs. non-manufacturing) to assess potential differences across sectors.

Analytical Techniques

To test the first two research hypotheses, we performed regression analyses in which the control variables were entered in the first step, followed by the inclusion of the independent variable in the second step. We also tested the mediating effect of knowledge sharing (internal and external) in the relationship between leader behavior and creative problem solving (Hypotheses 3a and 3b). Baron and Kenny (1986) suggested that to establish a mediation model, three basic conditions must be met: (1) there must be a significant relationship between the dependent variables and the independent variables, (2) a significant relationship between the mediator and independent variables, and (3) the significant relationship between the dependent variables and the independent variables becomes non-significant when the mediator is specified in the model. A more recent development was suggested by Kenny, Kashy, and Bolger (1998), according to which a variable (M) mediates the relationship between an antecedent variable (X) and an outcome variable (Y) if (a) X is significantly related to Y, (b) X is significantly related to M, (c) after X is controlled for, M remains significantly related to Y, and (d) after M is controlled for, the X–Y relationship is zero. Kenny et al. (1998, p. 260) describe these steps as "the essential steps in establishing mediation." The first step "is not required, but a path from the initial variable to the outcome is implied if [the two middle steps] are met." Accordingly, we performed a series of hierarchical regressions to examine whether a full mediation had been supported.

Study 1: Results

The means, standard deviations, and correlations between the research variables are presented in Table I. Leader behavior was significantly associated with internal knowledge sharing ($r = .35$, $p < .01$), external knowledge sharing ($r = .26$, $p < .01$), and creative problem-solving capacity ($r = .44$, $p < .01$). Both internal knowledge sharing and external knowledge sharing were significantly related to creative problem-solving capacity ($r = .47$, $p < .01$; $r = .43$, $p < .01$, respectively).

Hypothesis Testing

Hypotheses 1a and 1b, which predicted that leader behaviors would be positively associated with both internal knowledge sharing and external knowledge sharing, were supported. Models 2 and 3 in Table II show the regressions of internal knowledge sharing and external knowledge sharing onto the control variables and leader behaviors. As hypothesized, there was a significant positive relationship between leader behaviors and both internal knowledge sharing and external knowledge sharing ($\beta = .36$, $p < .01$; $\beta = .29$, $p < .01$, respectively).

Hypotheses 2a and 2b predicted that both internal knowledge sharing and external knowledge sharing would be positively related to creative problem-solving capacity. The results of Model 4 in Table II indicate a positive and significant relationship between internal knowledge sharing and creative problem-solving capacity ($\beta = .33$, $p < .01$), as well as between external knowledge sharing and creative problem-solving capacity ($\beta = .26$, $p < .01$), thus providing support for Hypotheses 2a and 2b.

To test Hypothesis 3, which predicted that both modes of knowledge sharing (internal and external) mediate the relationship between leader behaviors and creative problem-solving capacity, we employed Baron and Kenny's (1986) and the Kenny et al. (1998) mediation guidelines. Model 1 shows the regression of creative problem solving onto leader behaviors. The beta coefficient was significant and positive in sign ($\beta = .44$, $p < .01$), in support of the first mediation condition. The results of the regressions of internal knowledge sharing and external knowledge sharing onto the control variables and leader behaviors (models 2 and 3 in Table II) indicate that the beta coefficients were significant and positive in sign ($\beta = .36$, $p < .01$; $\beta = .29$, $p < .01$, respectively), thus supporting the second mediation condition. Model 4 in Table II shows the regression equations for creative problem solving on both the independent variable and on the mediators. As can be seen from both Table II and Figure 1, the coefficient of leader behaviors in relation to creative problem solving decreased in magnitude but remained significant ($\beta = .44$, $p < .01$ vs. $\beta = .28$, $p < .001$). These results indicate that both modes of knowledge sharing (internal and external) partially mediate the relationship between leader behaviors and creative problem-solving capacity. Hence, partial support was provided for Hypothesis 3. We also performed a Sobel test for mediation. The test statistics regarding the mediating role of internal knowledge sharing were 4.11, SD = .026, and $p = .00$. In addition, the test statistics regarding the mediating role of external knowledge sharing were 3.19, SD = .021, and $p = .001$.

Study 1: Discussion

Study 1 helps unpack the role that leaders play in facilitating both internal and external knowledge sharing, thereby enhancing creative problem-solving capacity in the workplace. Our findings suggest that leaders, by facilitating knowledge sharing between members in the organization and between organizational members and people outside the organization, improve employee capacity to solve problems creatively.

At the same time, we do not know whether creative problem solving, facilitated by leader behaviors and knowledge sharing, enhances creative performance. What is the relationship between leadership, knowledge sharing, creative problem-solving capacity,

TABLE 1 Study 1: Means, Standard Deviations, and Correlations

	Mean	SD	1	2	3	4	5	6	7	8	9
1. Sector (1= Manufacturing, 0 = Non-manufacturing)	–	–	–								
2. Gender	–	–	−.11	–							
3. Age	37.92	10.12	.01	.15*	–						
4. Tenure in the Organization	10.42	8.69	.05	.05	.84**	–					
5. Education	3.88	.99	.06	.06	.12*	−.05	–				
6. Leader Behaviors	3.59	.85	.06	.00	−.18**	−.21**	.11	(.85)			
7. Internal Knowledge Sharing	3.92	.73	.14*	.03	.03	.00	.08	.35**	(.87)		
8. External Knowledge Sharing	3.48	.85	.09	.00	.06	.07	.01	.26**	.54**	(.89)	
9. Creative Problem Solving	3.27	.77	−.05	.08	−.03	−.06	.19*	.45**	.47**	.43**	(.94)

$N = 274$; two-tailed test; reliabilities are in parentheses on the diagonal.
*$p < .05$, **$p < .01$.

TABLE II **Study 1: Hierarchical Regression Results for the Mediating Effect of Knowledge Sharing (Internal and External) in the Relationship Between Leader Behaviors and Creative Problem-Solving Capacity**

	Model 1 β (t) Creative Problem Solving	Model 2 β (t) Internal Knowledge Sharing	Model 3 β (t) External Knowledge Sharing	Model 4 β (t) Creative Problem Solving	Model 5 β (t) Creative Problem Solving
Constant[a]	1.32 (4.23**)	2.42 (7.81**)	2.30 (6.15**)	.70 (2.24**)	2.73 (9.56**)
Sector (1= Manufacturing, 0 = Non-manufacturing)	−.09 (−1.57)	.12 (2.13*)	.06 (1.11)	−.13 (2.48*)	−.13 (2.66*)
Gender	.06 (1.03)	.03 (.47)	.00 (.07)	.05 (.99)	.05 (.98)
Age	−.02 (−.18)	.08 (.68)	.01 (.11)	−.07 (−.68)	−.04 (−.44)
Tenure in the Organization	.05 (.50)	.01 (.09)	.12 (1.03)	−.01 (−.15)	.02 (.25)
Education	.15 (2.65**)	.02 (.35)	−.02 (−.32)	.17 (3.27**)	.15 (2.91**)
R^2	.05	.03	.01	.05	.05
Adjusted R^2	.03	.01	−.01	.03	.03
F for R^2	2.72*	1.50	.67	2.72*	2.72*
Std. Error of the Estimate	.75	.72	.85	.75	.76
Internal Knowledge Sharing				.33 (5.53**)	.26 (4.23**)
External Knowledge Sharing				.26 (4.30**)	.22 (3.87**)
ΔR^2				.27	.27
F for ΔR^2				52.10**	52.10**
R^2				.32	.32
Adjusted R^2				.30	.30
Std. Error of the Estimate				.64	.64
Leader Behaviors	.44 (8.01**)	.36 (6.16**)	.29 (4.77**)		.28 (5.34**)
ΔR^2	.18	.12	.08		.07
F for ΔR^2	64.08**	37.96**	22.78**		28.60**
R^2	.23	.15	.09		.38
Adjusted R^2	.22	.13	.07		.36
Std. Error of the Estimate	.68	.68	.82		.61

[a]Unstandardized coefficients; *$p < .05$, **$p < .01$.

and creative performance? In the next study, we aimed to address this issue by examining objective creative performance of technicians in an organization that provides utility services. In particular, we examined the same model as in Study 1 but expanded on it by incorporating creative performance as a work outcome. Thus, we explore the link between creative problem solving and creative performance.

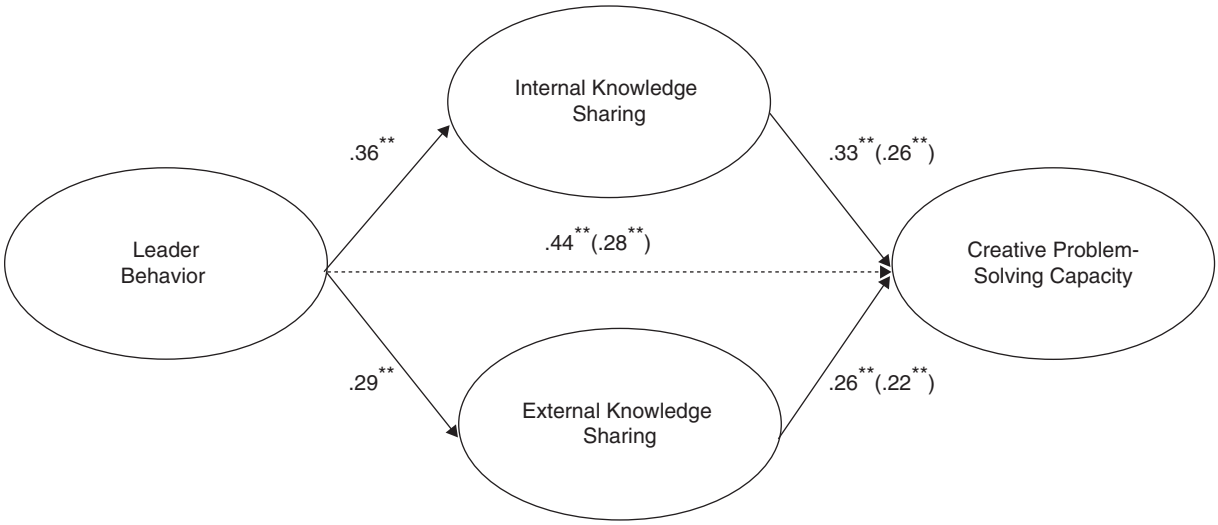

FIGURE 1. Study 1: Results of the Hypothesized Model.

Note: Betas in parantheses are based on regression equations including the connectedness mediator, from the series of regressions presented in Table II. Dashes denote indirect effects.
*$p < .05$, **$p < .01$.

Creative Problem-Solving Capacity and Creative Performance

Creative problem-solving processes have been viewed as an important antecedent for creativity (Mumford et al., 1991; Reiter-Palmon & Illies, 2004). Empirical evaluations of various processes of creative problem solving have indicated that these processes are indeed important and effective predictors of creative performance. For example, Reiter-Palmon et al. (1997) found that problem construction and identification ability was a predictor of creative performance in a creative problem-solving task. Further, active engagement in problem construction and identification were also predictive of creative performance. In a study that evaluated multiple cognitive processes, Mumford, Supinski, Baughman, Costanza, and Threlfall (1997) found that multiple cognitive processes were predictive of performance in two different creative tasks. Specifically, problem construction and identification and idea generation emerged as important predictors. Other cognitive processes such as idea evaluation and implementation have also been linked empirically to creative performance, although the research is much more limited (Mumford & Hunter, 2005). However, research indicates that idea evaluation and implementation planning is an important predictor of creative performance (Lonergan, Scott, & Mumford, 2004). Further, creative individuals are also more likely to correctly evaluate creative ideas (Basadur, Runco, & Vega, 2000). This stream of research suggests that engaging in creative problem-solving processes should be related to creative performance.

Hypothesis 4: Creative problem-solving capacity is positively associated with creative performance.

Study 2: Method

Sample and Procedure

Study 2 involved 130 full-time employees working in an organization that provides utility services. The employees are technicians who are responsible for solving technical problems in the infrastructure and delivery of utility services. For instance, when infrastructure, technology process, or end-user incident are observed, these employees engage in solving

and fixing the problem, which often requires technical skills, improvisation, and creativity. The sample was identified through personal connections with a senior manager in the organization. The surveys were administered to respondents and collected on site. In a cover letter each respondent received, we briefly indicated that the study was aimed at learning about employees' perceptions of organizational knowledge. Participants were assured confidentiality.

We received 130 usable surveys, representing a response rate of 86.66 percent. The respondents' average age was 45.01 years (SD = 7.27), and their average tenure in the organization was 20.22 years (SD = 6.87). Three percent of the respondents were female. A total of 44.6 percent had a high school diploma, 36.9 percent had a BA degree, and the remaining had an MA degree.

Measures

All measurement items, except for creative performance, were the same as in Study 1 and are shown in the Appendix.

Creative Performance

We asked the participants to write down as many uses as they could think of for an object they were familiar with from their daily work—namely, a device used to alert pilots that an airplane is too close to the ground. We created two measures of creative performance: fluency (the number of ideas each participant generated) and originality (the number of highly original ideas—those mentioned by fewer than 1 percent of the sample). The coding was done by two creativity scholars; minor differences were resolved through discussion until reaching full agreement.

Creative Problem-Solving Capacity

As in Study 1, based on the Reiter-Palmon and Illies (2004) conceptualization, eight items were used to assess employee engagement in creative problem-solving processes. Respondents were asked to indicate on a five-point scale (ranging from 1 = not at all to 5 = to a large extent) the extent to which they possessed capabilities to solve problems creatively using the following four dimensions: problem identification and construction, idea generation, idea evaluation, and implementation. Results of an exploratory factor analysis indicated that all eight items loaded onto one factor with an eigenvalue of 6.22 and explained 77.77 percent of the variability, and had factor loadings ranging from .86 to .90. The Cronbach's alpha for this measure was .96.

Knowledge Sharing

As in Study 1, following previous research (e.g., Lee, 2001; Lu et al., 2006), eight items were used to assess the extent to which employees exchange knowledge with colleagues inside and outside their organization. Respondents were asked to indicate on a five-point scale (ranging from 1 = not at all to 5 = to a large extent) the extent to which they exchange knowledge with both their colleagues inside the organization (i.e., internal knowledge sharing) and people outside the organization (i.e., external knowledge sharing). Results of an exploratory factor analysis indicated that the eight items loaded onto two factors (four items per factor). One factor, internal knowledge sharing, had an eigenvalue of 4.76 and explained 59.53 percent of the variability, and had factor loadings ranging from .84 to .86. The second factor, external knowledge sharing, had an eigenvalue of 1.44 and explained an additional 18.03 percent of the variability, and had factor loadings ranging from .69 to .916. Together, these two factors explained 77.56 percent of the variance. The Cronbach's alphas for internal and external knowledge-sharing measures were .91 and .90, respectively.

Leader Behavior

As in Study 1, we followed previous studies on leadership and knowledge exchange or sharing (e.g., Carmeli & Waldman, 2010;

Connelly & Kelloway, 2003), and constructed four items to assess the extent to which employees believe their manager supports and encourages knowledge exchange. Responses were on a five-point scale (ranging from 1 = not at all to 5 = to a large extent). Results of an exploratory factor analysis indicated that all four items loaded onto one factor with an eigenvalue of 3.15 and explained 78.71 percent of the variability, and had factor loadings ranging from .86 to .91. The Cronbach's alpha for this measure was .91.

Control Variables

We controlled for respondent gender, age, tenure in the organization, and educational level to test whether they accounted for some of the variance in creative performance.

Study 2: Results

The means, standard deviations, and correlations between the research variables are presented in Table III. Leader behavior was significantly associated with internal knowledge sharing ($r = .29$, $p < .01$) and creative problem-solving capacity ($r = .27$, $p < .01$). Both internal knowledge sharing and external knowledge sharing were significantly related to creative problem-solving capacity ($r = .52$, $p < .01$; $r = .28$, $p < .01$, respectively). In addition, creative problem-solving capacity was significantly related to both facets of creative performance—fluency ($r = .23$, $p < .05$) and originality ($r = .27$, $p < .01$).

Hypothesis Testing

The results of Models 2 and 3 in Table IV indicate a significant positive relationship between leader behaviors and both internal knowledge sharing and external knowledge sharing ($\beta = .34$, $p < .01$; $\beta = .18$, $p < .05$, respectively), thus in support of both Hypotheses 1a and 1b.

Hypotheses 2a and 2b predicted that both internal knowledge sharing and external knowledge sharing would be positively related to creative problem solving. The results of Model 4 in Table IV indicate a positive and significant relationship between internal knowledge sharing and creative problem solving ($\beta = .49$, $p < .01$) but no statistically significant link between external knowledge sharing and creative problem solving ($\beta = .01$, $p > .10$), thus providing support only for Hypothesis 2a.

To test Hypotheses 3 and 4, we performed two sets of regression analyses in line with the Baron and Kenny (1986) and Kenny et al. (1998) mediation guidelines. The first set of regressions is shown in Table V and tests whether creative problem solving mediates the relationship between both internal and external knowledge sharing and creative performance–fluency. The second set of regressions is shown in Table VI and tests whether creative problem solving mediates the relationship between both internal and external knowledge sharing and creative performance–originality. As can be seen from both Table V and Figure 2, the coefficient of internal knowledge sharing in relation to creative performance–fluency decreased in magnitude but remained significant ($\beta = .30$, $p < .01$ vs. $\beta = .25$, $p < .05$). The results also indicate that external knowledge sharing was not significantly related to creative problem solving ($\beta = .01$, $p > .10$), thus failing to support the mediation model of external knowledge sharing → creative problem solving → creative performance–fluency. However, the results indicate that creative problem solving partially mediates the relationship between internal knowledge sharing and creative performance–fluency.

As can be seen from both Table VI and Figure 2, the coefficient of internal knowledge sharing in relation to creative performance–fluency became non-significant ($\beta = .23$, $p < .01$ vs. $\beta = .14$, $p < .05$), while the relationship between creative problem solving and creative performance–originality remained significant, though marginally ($\beta = .25$, $p < .01$ vs. $\beta = .19$, $p = .08$). This provides support for the mediation role of creative problem solving in the relationship between internal knowledge sharing and creative performance–originality. As mentioned, because the link between external

TABLE III Study 2: Means, Standard Deviations, and Correlations

	Mean	SD	1	2	3	4	5	6	7	8	9	10
1. Gender	–	–	–									
2. Age	45.01	7.27	.00	–								
3. Tenure in the Organization	20.22	6.87	−.01	.83**	–							
4. Education	2.81	1.91	−.11	−.01	−.04	–						
5. Leader Behaviors	3.24	1.04	−.02	−.17	−.16	.11	(.91)					
6. Internal Knowledge Sharing	4.00	.74	−.09	.22*	.17	.10	.29**	(.91)				
7. External Knowledge Sharing	3.49	.82	−.07	.16	.13	.06	.15	.54**	(.90)			
8. Creative Problem Solving	3.96	.79	−.16	.17	.11	.13	.27**	.52**	.28*	(.95)		
9. Creativity (Fluency)	2.86	1.61	.00	.20*	.20*	.01	.03	.31**	.16	.23*	–	
10. Creativity (Originality)	1.00	1.07	.00	.17	.09	−.01	.03	.25**	.14	.27**	.73**	–

$N = 130$; two-tailed test; reliabilities are in parentheses on the diagonal.
* $p < .05$, ** $p < .01$.

TABLE IV **Study 2: Hierarchical Regression Results for the Mediating Effect of Knowledge Sharing (Internal and External) in the Relationship Between Leader Behaviors and Creative Problem-Solving Capacity**

	Model 1 β (t) Creative Problem-Solving Capacity	Model 2 β (t) Internal Knowledge Sharing	Model 3 β (t) External Knowledge Sharing	Model 4 β (t) Creative Problem-Solving Capacity	Model 5 β (t) Creative Problem-Solving Capacity
Constant[a]	3.63 (5.13**)	3.42 (5.13**)	3.17 (4.28**)	3.63 (5.13**)	3.63 (5.13**)
Gender	−.15 (−1.73)	−.09 (−1.03)	−.08 (−.82)	−.11 (−1.36)	−.11 (−1.4)
Age	.28 (1.61)	.24 (1.37)	.12 (.64)	.15 (.95)	.18 (1.11)
Tenure in the Organization	−.08 (−.53)	−.05 (−.32)	−.02 (−.15)	−.06 (−.44)	−.06 (−.43)
Education	.01 (.06)	.10 (.83)	.12 (.93)	−.05 (−.46)	−.04 (−.33)
R^2	.057	.059	.036	.057	.057
Adjusted R^2	.023	.025	.01	.023	.023
F for R^2	1.68	1.74	1.04	1.68	1.68
Std. Error of the Estimate	.779	.732	.816	.779	.779
Internal Knowledge Sharing				.49 (5.10**)	.44 (4.39**)
External Knowledge Sharing				.01 (−.00)	−.00 (−.01)
ΔR^2				.231	.231
F for ΔR^2				17.86**	17.86**
R^2				.288	.288
Adjusted R^2				.249	.249
Std. Error of the Estimate				.683	.683
Leader Behaviors	.30 (3.39**)	.34 (3.86**)	.18 (1.94*)		.15 (1.76)
ΔR^2	.088	.111	.036		.02
F for ΔR^2	11.49**	14.91**	3.77*		3.09
R^2	.145	.17	.068		.308
Adjusted R^2	.107	.133	.026		.263
Std. Error of the Estimate	.745	.691	.806		.676

[a] Unstandardized coefficients; *$p < .05$, **$p < .01$.

TABLE V **Study 2: Hierarchical Regression Results for the Mediating Effect of Creative Problem-Solving Capacity in the Relationship Between Knowledge Sharing (Internal and External) and Creativity (Fluency)**

	Model 1 β (t) Creativity (Fluency)	Model 2 β (t) Creative Problem-Solving Capacity	Model 3 β (t) Creativity (Fluency)	Model 4 β (t) Creativity (Fluency)
Constant[a]	1.75 (1.13)	3.63 (5.12**)	1.75 (1.13)	1.75 (1.13)
Gender	.02 (.22)	−.11 (−1.36)	.03 (.23)	.03 (.32)
Age	−.04 (−.23)	.15 (.95)	−.04 (−.20)	−.06 (−.31)
Tenure in the Organization	.10 (.63)	−.06 (−.44)	.11 (.63)	.12 (.67)
Education	.13 (.92)	−.05 (−.46)	.15 (1.07)	.13 (.95)
R^2	.053	.057	.053	.053
Adjusted R^2	.015	.023	.015	.015
F for R^2	1.38	1.68	1.38	1.38
Std. Error of the Estimate	1.602	.779	1.602	1.602
Creative Problem-Solving Capacity			.21 (2.12*)	.09 (.83)
ΔR^2			.042	.042
F for ΔR^2			4.49*	4.49*
R^2			.095	.095
Adjusted R^2			.048	.048
Std. Error of the Estimate			1.575	1.575
Internal Knowledge Sharing	.30 (2.62**)	.49 (5.10**)		.25 (1.99*)
External Knowledge Sharing	−.03 (−.29)	.00 (−.00)		−.03 (−.29)
ΔR^2	.076	.231		.04
F for ΔR^2	4.22*	17.85**		2.24
R^2	.129	.288		.135
Adjusted R^2	.075	.249		.072
Std. Error of the Estimate	1.552	.683		1.552

[a]Unstandardized coefficients; $p < .10$, *$p < .05$; **$p < .01$.

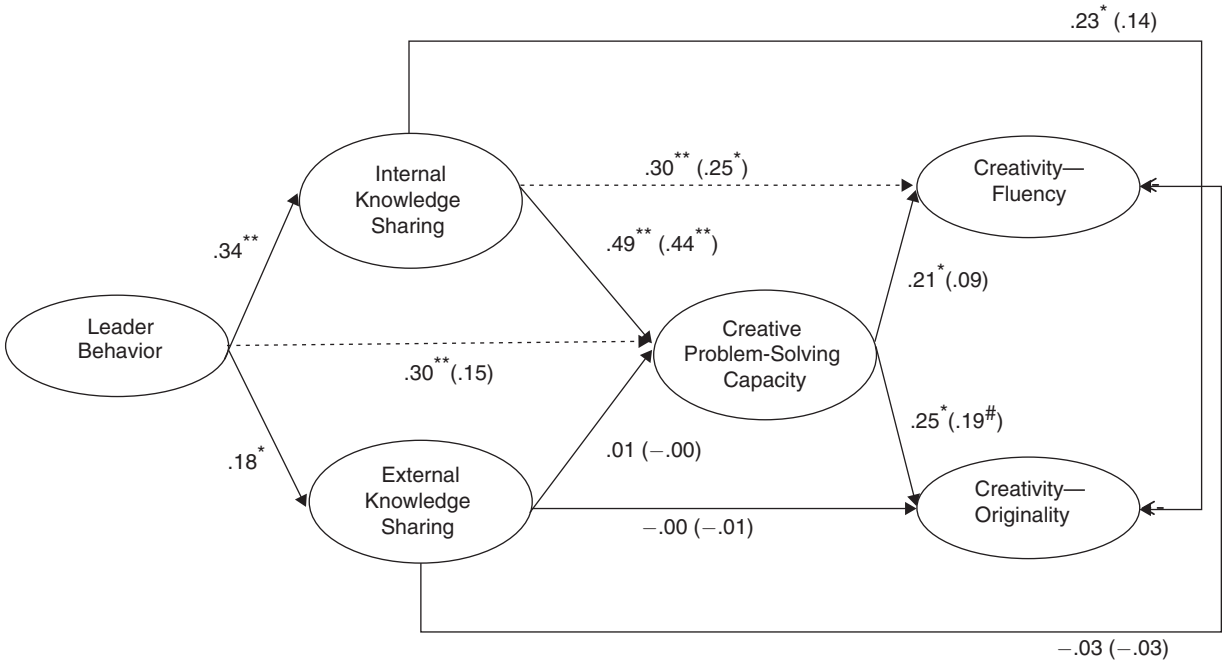

FIGURE 2. Study 2: Results of the Hypothesized model.

Note: Betas in parantheses are based on regression equations including the connectedness mediator, from the series of regressions presented in Tables IV, V, and VI. Dashes denote indirect effects.
$^{\#}p < .10$, $^{*}p < .05$, $^{**}p < .01$.

knowledge sharing and creative problem solving was not significant ($\beta = .01$, $p > .10$), the necessary condition for mediation was not met. Thus, the results lend support to the hypothesis according to which creative problem solving mediates the relationship between internal knowledge sharing and creative performance–originality. We also performed a Sobel test for mediation for these two sets of mediations. The test statistics are in support of (1) full mediation of creative problem solving in the relationship between internal knowledge sharing and creative performance–originality and (2) partial mediation of creative problem solving in the relationship between internal knowledge sharing and creative performance–fluency.

Finally, the results of Model 3 in Table V indicate a positive relationship between creative problem solving and creative performance–fluency ($\beta = .21$, $p < .05$). The results of Model 3 in Table VI indicate a positive relationship between creative problem solving and creative performance–originality ($\beta = .25$, $p < .01$). These findings support Hypothesis 4.

General Discussion

Theoretical Implications

These studies make several theoretical contributions to the literature. We drew upon three often distinct streams of research—leadership, knowledge management, and creativity—to explore the links between leader supportive behaviors, internal and external knowledge sharing, employee capacity for creative problem solving, and creative performance.

Specifically, while researchers have long pointed to the significance of knowledge sharing in enhancing creativity and innovation and the overall effectiveness of individuals, teams, and organizations (Chowdhury, 2005; Daellenbach & Davenport, 2004; Hansen, 1999), much research has tended to focus on either internal or external knowledge sharing, with more studies examining internal knowledge-sharing behaviors (e.g., Lu et al., 2006). In this study, we sought to provide a more parsimonious way to distinguish the two constructs and assess internal and external knowledge sharing independently. In so doing, we were able to

TABLE VI **Study 2: Hierarchical Regression Results for the Mediating Effect of Creative Problem-Solving Capacity in the Relationship Between Knowledge Sharing (Internal and External) and Creativity (Originality)**

	Model 1 β (t) Creativity (Originality)	Model 2 β (t) Creative Problem-Solving Capacity	Model 3 β (t) Creativity (Originality)	Model 4 β (t) Creativity (Originality)
Constant[a]	−1.46 (−1.46)	3.63 (5.12**)	−1.64 (−1.60)	−1.78 (−1.52)
Gender	.01 (.15)	−.11 (−1.36)	.03 (.37)	.03 (.38)
Age	.23 (1.37)	.15 (.95)	.23 (1.36)	.20 (1.24)
Tenure in the Organization	−.14 (−.82)	−.06 (−.44)	−.13 (−.76)	−.13 (−.75)
Education	−.04 (−.38)	−.05 (−.46)	−.04 (−.47)	−.04 (−.38)
R^2	.034	.057	.034	.034
Adjusted R^2	.00	.023	.00	.00
F for R^2	.99	1.68	.99	1.00
Std. Error of the Estimate	1.072	.779	1.072	1.072
Creative Problem-Solving Capacity			.25 (2.62**)	.19 (1.77#)
ΔR^2			.062	.062
F for ΔR^2			7.52**	7.52**
R^2			.096	.096
Adjusted R^2			.055	.055
Std. Error of the Estimate			1.042	1.042
Internal Knowledge Sharing	.23 (2.09*)	.49 (5.10**)		.14 (1.03**)
External Knowledge Sharing	−.00 (−.04)	.00 (−.00)		−.00 (−.03)
ΔR^2	.05	.231		.12
F for ΔR^2	2.946**	17.85**		.646
R^2	.084	.288		.11
Adjusted R^2	.034	.249		.052
Std. Error of the Estimate	1.054	.683		1.044

[a]Unstandardized coefficients; #$p < .10$, *$p < .05$; **$p < .01$.

determine that both internal and external knowledge sharing are important in contributing to employee creative capacity (Study 1), and internal knowledge sharing was an important contributor to creative performance (Study 2). The findings lend further support to theories of knowledge management and creativity, which have noted the importance of dissemination of knowledge between parties (Lee, 2001). This process is fundamental for cultivating capacities to solve problems creatively, as people need to possess knowledge or expertise in their domain to come up with novel and useful solutions for a given problem and create new knowledge assets (Amabile, 1988; Collins & Smith, 2006; Mumford & Hunter, 2005; Nonaka & Takeuchi, 1995; Weisberg, 1999). Through gaining access to and exchanging knowledge with others, the cognitive capacities of individuals and teams are expanded, thus enabling them to come up with creative ideas to solve complex problems (Mumford et al., 1991).

This study adds to our understanding of the relationship between creative problem-solving processes and creative performance, providing further support for the importance of these capacities in creative production.

In addition, the findings provide useful knowledge about the process by which leadership can cultivate individual capacities for creative problem solving. The results indicate that leaders who model and encourage knowledge sharing in their organizations instill perceptions among employees about the merits of sharing knowledge with others inside and outside the organization, as well as facilitate employee knowledge-sharing behaviors. Importantly, our findings indicate that leadership and knowledge sharing are both important contributors to an enhanced capacity for creative problem solving. This is vital as we further develop research and theory on the leadership–creative problem solving link (Reiter-Palmon & Illies, 2004) by defining the contextual explanatory variables, thus moving beyond studies on cognitive personality and traits as predictors of the cognitive process of creative problem solving. Finally, we also elaborate on previous research on leader expectations and behaviors as an important enabler of employee creative work involvement and creative behaviors (Carmeli & Schaubroeck, 2007; Tierney & Farmer, 2004; Tierney, Farmer, & Graen, 1999), by contributing to the relatively limited body of research on the specific behaviors that leaders can engage in that facilitate creative problem-solving capacity and creative performance (Reiter-Palmon & Illies, 2004).

Finally, this study sheds light on the relationship between creative problem-solving processes or capacities and creative performance. This study indicates that leader behavior, both directly and indirectly, through its effect on internal knowledge sharing, influences creative problem-solving capacity. Internal knowledge sharing also has a direct and indirect effect on creative performance, through creative problem-solving capacity. This study adds to our understanding of the relationship between creative problem-solving processes and creative performance, providing further support for the importance of these capacities in creative production (Mumford et al., 1991).

Limitations and Future Research Directions

Our study is not without limitations, and thus its findings must be interpreted with caution. Although we provided theoretical reasoning for our model, the extent to which cause–effect relationships may be inferred is limited. It could be claimed that people who have a high creative problem-solving ability are likely to share more knowledge than those who possess low-level capacities of creative problem solving. Similar to the extant body of leadership that uses the same approach as in this study for assessing leader behaviors (by using followers' reports), we do not know what additional factors influence followers' perceptions of leader behaviors. Thus, one could speculate that people who are willing to and actively share knowledge with others may perceive their leader's behaviors as more supportive of knowledge sharing. Thus, a longitudinal design is required to

shed further light on this causal relationship and inference.

Caution is needed due to the use of a convenient sample (i.e., accessing sampled organizations through personal connection), and this limits the generalizability of the findings. We also used survey self-reports, which may lead to common method bias. We tested for common method bias by examining whether demographic variables such as tenure, age, and gender explained the variation in both the mediators and dependent variables and found no significant differences ($p > .10$). In addition, the correlations between the independent, mediating, and dependent variables did not exceed the level for which problems of data inflation and multicollinearity are severe (Belsley, Kuh, & Welsch, 1980). However, we realize that the single-source and common method issue cannot be resolved using statistical tools, and thus one needs to interpret the results with caution. Finally, in Study 2, we used a more objective assessment of creative performance. Nevertheless, future research could further alleviate this concern by employing objective measures of knowledge sharing, as well as potential experts to evaluate individual creative problem-solving capacity. We did not control for the potential effect of job level, and thus future research needs to examine this control variable and its impact on creativity. We also did not examine other potential explanatory variables that can shed further light on the relationship between leadership, knowledge sharing, creative problem-solving capacity, and creative performance. For instance, could an individual having a capacity for solving problems creatively refrain from exhibiting creativity, because she or he lacks the level of trust and self-efficacious beliefs? This issue may need further examination and deliberation in future research.

Another important issue that has not been addressed in these studies is that of team creativity. The current studies focus on individual capacity and individual performance. However, knowledge sharing is inherently a social process. In recent years, the interest in team creativity has increased. Evaluating the role of leadership and knowledge sharing on team creativity is important to our understanding of these constructs and their effect on creativity. Further, in the current study, we focused on individual perceptions of knowledge sharing. Future studies should evaluate the construct at a team level, adding to our understanding of the multilevel nature of creativity in organizations (Mumford & Hunter, 2005).

Implications for HRM Practice and Managers

These studies also provide some important implications for human resource management (HRM). First, they lend support to previous work showing that knowledge sharing with internal as well as external sources may be beneficial for engagement in cognitive processes associated with creativity and creative performance. HRM practices designed to facilitate knowledge sharing (Gagne, 2009) and the way they are structured are likely to improve creativity (Binyamin & Carmeli, 2010). While most efforts in this area are focused on technology that can facilitate knowledge sharing, other factors that are more directly related to HRM may be important facilitators or inhibitors of knowledge sharing.

For example, performance expectations and performance evaluation systems may emphasize other aspects of a job, or may include knowledge sharing as an important dimension of job performance. If the performance evaluation system includes knowledge sharing as a dimension on which the employee is evaluated, this not only encourages individuals to share information because they know it is part of the evaluation, but it also signals that this is an activity the organization views as important. Training can also be used to facilitate knowledge sharing.

If the performance evaluation system includes knowledge sharing as a dimension on which the employee is evaluated, this not only encourages individuals to share information because they know it is part of the evaluation, but it also signals that this is an activity the organization views as important.

Employees may be reluctant to share knowledge because they are concerned about divulging proprietary information. This may play an important role when employees share information outside of the organization. Training employees on what can be shared and what cannot be shared may alleviate some of these concerns.

More importantly, the results of this study indicate that leader behaviors facilitate knowledge sharing by providing a role model and shaping a culture that supports knowledge sharing. First, as leaders have emerged as a critical influence on knowledge sharing and employee creativity, this study provides some important implications for the selection and development of leaders, especially leaders in knowledge-intensive industries. Leadership selection may include a way to assess a leader's attitudes toward knowledge sharing and actual past behaviors of knowledge sharing. The current studies demonstrate that both leader support (positive attitude) and actual behavior are important for knowledge sharing and subsequent creativity. Therefore, selecting leaders who can provide support and role modeling will facilitate knowledge sharing. In addition, leadership development programs could include a unit not only on the importance of knowledge sharing, but also about the importance of modeling knowledge sharing and developing a climate in which knowledge sharing is acceptable and encouraged. Second, leaders encourage and facilitate knowledge sharing by serving as a role model for these processes. For instance, Robert Buckman, the CEO of Buckman Laboratories, facilitated vertical knowledge sharing by engaging in lengthy online discussions with salespeople about compensation policy and packages (O'Dell, 2004). He encouraged organizational members to be involved and voice their opinions by sharing his views, knowledge, and experiences with them.

Conclusion

This work contributes to research on leadership, knowledge sharing, creative problem solving, and creative performance. We sought to better understand the role of leadership in facilitating knowledge sharing within and outside the organization, and whether these processes further cultivate employee capacity to solve problems creatively. Our study showed that leader supportive behaviors directly and indirectly, through internal and external knowledge sharing, cultivate individual engagement in creative problem-solving processes. In so doing, this study sheds further light on the processes by which leadership, through knowledge-sharing activities, cultivates the creative problem-solving capacity of individuals in the workplace.

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APPENDIX **Results of Factor Analysis for Creative Problem-Solving Capacity, Knowledge Sharing (Internal and External), and Leader Behavior**

Indicators of the Factor Creative Problem-Solving Capacity	Factor Loading
Capability to define work problems creatively (*problem definition and construction*)	.82
Skill to creatively articulate work problems (*problem definition and construction*)	.81
Ability to generate novel ideas to solve work problems (*idea generation*)	.84
Capability to suggest creative solutions to work problems (*idea generation*)	.86
Capability to appreciate what ideas are best for solving work problems (*idea evaluation*)	.84
Capability to choose the optimal solution for a specific work problem (*idea evaluation*)	.82
Capability to effectively implement novel ideas chosen to solve a specific work problem (*idea implementation*)	.85
Capability to implement the chosen creative solution to solve a specific work problem (*idea implementation*)	.85
Eigenvalue = 5.62; cumulative variance explained = 70.29%	

Indicators of the Knowledge Exchange	Internal Knowledge Exchange Factor Loading	External Knowledge Exchange Factor Loading
Meet with my colleagues in this organization and exchange ideas with them regularly	.21	.83
Access my colleagues in this organization and exchange new ideas and developments with them	.23	.88
Interact with my colleagues in this organization to discuss suggestions and ideas	.24	.85
Make sure to be available for sharing experiences with my colleagues in this organization	.27	.73
Meet and exchange ideas regularly with people outside this organization	.79	.34
Access people outside this organization and exchange new ideas and developments with them	.90	.20
Interact with people outside this organization to discuss suggestions and ideas	.85	.29
Available for sharing experiences with people outside this organization	.79	.19
Eigenvalue	4.61	1.37
Variance explained	37.66%	37.17%

Indicators of the Factor Leader Behaviors	Factor Loading
The manager encourages information exchange between members	.84
The manager encourages openness in the discussion meetings	.86
The manager encourages members to share ideas with each other	.83
The manager is a role model for collaboration and knowledge exchange	.80
Eigenvalue = 5.62; variance explained = 69.14%	