Leader creativity expectations and follower radical creativity

Based on the perspective of creative process

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Abstract

Purpose – The purpose of this study is to research the effect of leader creativity expectations on follower radical creativity. Highlighting the implications of leader creativity expectations, the authors examined employee creative process engagement as a mediator and follower perceived procedural justice as a moderator in the relationship between leader creativity expectations and employee radical creativity.

Design/methodology/approach – A sample of 256 dyads comprising full-time employees and their immediate supervisors were collected from the innovation teams of industry-university alliances through questionnaire in China, the authors hypothesized and found support for a moderated mediation model.

Findings – The findings show that leader creativity expectations are significantly and positively related to employee radical creativity; creative process engagement plays a fully mediating role between leader creativity expectations and employee radical creativity; procedural justice moderates the positive relationship between leader creativity expectations and creative process engagement and enhances the positive indirect effect of leader creativity expectations on follower radical creativity.

Practical implications – The creativity expectations of leaders are prerequisite for leadership to drive followers to be creative, which can pose great effect on extra-role behavior of followers such as radical creativity. Leaders can deliberately set role expectations for subordinates to achieve creative goals. Compared with the traditional management practices emphasizing planning, leaders encourage trial practice, provide enough time to ensure employees fully identify problems and provide resources to facilitate information search and coding, may achieve better results. Organizations should also place greater emphasis on the procedural justice, thereby enhancing the positive impact of other factors on employee radical creativity.

Originality/value – This study examined the relationship between leader creativity expectations and follower radical creativity based on the perspective of creative process engagement. The conclusion expanded the evidence of the impact of leader expectations besides this study strongly demonstrate that procedural justice will affect employees creative process engagement which enriches the literature on radical creativity strategic leadership and work engagement.

Keywords Procedural justice, Creative process engagement, Follower radical creativity, Leader creativity expectations

Paper type Research paper

1. Introduction

Organizational innovation starts with creative thoughts and proactive behaviors at the individual level (Cerne et al., 2017). R&D personnel represent a potential creative pool, developing and promoting organizational innovation at multiple levels (Foss et al., 2013). Employee creativity brings innovation which is an important factor for the organizational competitive advantage and success (Woodman et al., 1993). Creativity means that employees apply a series of their diversified skills, knowledge, abilities and experience to generate new ideas for problem-solving, decision-making and completion of assigned tasks in efficient ways (Cheung and Wong, 2011). According to the difference in the novelty of these ideas, creativity can be classified as incremental creativity and radical creativity (Madjar et al., 2011).
Previous studies have found that innovative colleagues, organizational identities and extrinsic motivation have stronger predictive effects on incremental creativity, while radical creativity are more dependent on employees’ willingness to take risks, the strategic leadership, the resources needed for innovation and intrinsic motivation (Madjar et al., 2011; Venkataramani et al., 2014).

A valuable human asset relies on leadership (Junquera and Bro, 2017). Leadership has always been considered as one of the key factors that stimulate individual creativity, especially in countries with collectivism and high power distance like China (Gumusluoglu et al., 2017). The literature on organizational leadership suggested that a key goal of leadership (assuming that it is a constructive influence which excludes the use of stress and threats) is to motivate followers to participate in activities that lead to the achievement of organizational goals (Ilies et al., 2006). Similarly, creativity literature also demonstrated that incentivizing followers to participate in the creative process and producing creative solutions is the core component of creative leadership (Tung and Yu, 2016). However, not all leaders tend to or can inspire their followers to be creative. The personal motivational status and characteristics of the leader may be the source of the team leader’s willingness and ability to direct subordinate creativity (Tierney and Farmer, 2008). Besides, a recent meta-analysis shows mixed results about the relationship between transformational leadership and employee creativity (Qu et al., 2015). Therefore, the fact challenged the simplistic relationship of leadership type – employee creativity. We need to consider the impact mechanism that how leadership is positively related to follower creativity (Lee et al., 2017). For example, Rosing et al. (2011) proposed that it is unreasonable to affirm that transformational leadership can promote follower creativity. Given the fact that transformational leaders may have different concerns or goals and are not necessarily expecting followers to participate in innovation. In other words, if a transformational leader motivates a subordinate to think independently and explore from a new direction, it may stimulate follower creativity. If a transformational leader expresses a clear goal (such as security and productivity) to motivate certain determined actions, such as efficiency and responsibility, it may suppress follower creativity. Hence, leader creativity expectations may be the prerequisite for leaders to inspire subordinates become more creative.

Obviously, linking leadership with follower creativity based on leader creativity expectations within the context of innovation team will deepen our understanding of the drive mechanisms of innovation. Tierney and Farmer (2004) found that leaders who hold higher creativity expectations for their subordinates demonstrate more innovative support behaviors, which further promote follower creative self-efficacy and creative process engagement by influencing follower perceived performance expectations (Carmeli and Schaubroeck, 2007).

However, the precise dynamics of this relationship remain under explored, especially for radical creativity, thereby calling for more research attention. Previous studies were mainly from the perspective of motivation and psychological level. For example, Jiang and Gu (2017) found creative self-efficacy mediated the positive relationship between leader creativity expectations and employee creativity. Qu et al. (2015) used relational identity as a mediator to study the influence mechanism of transformational leadership on subordinate creativity; Koseoglu et al. (2017) used the creative role identity of subordinates as a mediator to study the relationship between supervisors’ and subordinates’ creativity; Jaiswal and Dhar (2015) studied the influence mechanism of action between transformational leadership and employee creativity through innovation climate and creative self-efficacy. These studies help us to understand the guiding role of leaders in inspiring employee creativity from the psychological level of motivation and willingness. Psychological identification and active
personality is necessary for employee creativity, they are not enough to produce excellent creativity, as they cannot fully explain the creative activity that form creativity (Gilson and Shalley, 2004).

In terms of the components of creativity, Amabile’s creativity model includes three core components: problem definition, information search and coding and program generation (Amabile, 1983). Therefore, as an advanced form of human intelligence, creativity requires individuals to have high-intensity thinking and processing. Without a creative process with enough work engagement, it is difficult to produce creativity. Dr Klein also mentioned when he followed Samuelson’s research work: “I tried to maximize contact with him and would sort out and think about his opinions at any time and anywhere” Koseoglu et al. (2017), indicating that the role of creative process engagement in promote creativity is at least as important as psychological factors. However, empirical research rarely examined how employee creative process engagement drives creativity, especially radical creativity. Therefore, to investigate the relationship between leader creativity expectations and follower radical creativity, we proposed creative process engagement serves as a mediator. That is, due to leaders have the power to assign work tasks and resources, their expectations of follower radical creativity will make employees see radical creativity as role requirements, and therefore internalize leader creativity expectations into employees’ self-creativity expectations, thus promote creative process engagement.

Organization is composed of personnel and regulations. The work behavior of employees is not only affected by the supervisor but also affected by the organizational principles. Besides, employee creativity not only needs the employee process engagement, it is also affected by the external environment, especially workplace (Prasad and Junni, 2016). Whereas leaders are often unable to directly influence an organization’s principles (He et al., 2017). Organizational creativity is the creation of new valuable ideas, products, services or procedures working together by employees in a complex social system (Woodman et al., 1993). In this process, the fairness of the organizational procedure is closely related to the employee’s creative process engagement. In fact, organizational procedural justice will seriously affect the attitude and behavior of employees (Colquitt et al., 2001). Therefore, we believe that organizational procedural justice and leader creativity expectations will together affect the creative process engagement of employees. Considering that organizational rules represent work environment factors, we proposed organizational procedural justice as a moderator.

Therefore, based on the perspective of the creative process, from both individual level and organizational level, we try to examine how (through creative process engagement and procedural justice) leader creativity expectations are positively related to follower radical creativity. Then, we theorize that the interactive effects of leader creativity expectations and procedural justice will have downstream implications for follower radical creativity, mediated by creative process engagement. The next part is literature review and hypothesis development, followed by hypothesis testing and result analysis. The theoretical model for this study is shown in Figure 1.
2. Theory and hypotheses

2.1 Leader creativity expectations and follower radical creativity

Organizational innovation starts with creative thinking and proactive behavior at the individual level, employee creativity brings innovation which is an important factor for the organizational competitive advantage and success (Woodman et al., 1993).

Employee radical creativity brings radical innovation. Radical innovation helps companies to achieve industry leading position or even monopoly position in the short term and form new core competitiveness. Therefore, it is of great significance to study how to better promote employee radical creativity at both theoretical and practical level. Since the current practice of an organization is usually based on the past success, so employees tend to choose incremental creativity (Chang et al., 2012). Therefore, we deem radical creativity is not the role of R&D personnel. Recent research also shows that radical creativity and incremental creativity have different antecedents. For example, studies have found that innovative colleagues, organizational identities and extrinsic motivation have a stronger predictive effect on incremental creativity, while radical creativity are more dependent on the strategic leadership, knowledge networks, employees’ willingness to take risks and intrinsic motivation (Madjar et al., 2011; Venkataramani et al., 2014; Tang et al., 2017). If leaders want to motivate employees to achieve radical innovation for organization, first of all, they should inspire followers’ radical creativity.

The essence of leadership is the impact of leaders on followers (Russell et al., 2018). According to Rosing et al. (2011), leadership does not necessarily promote follower creativity. Leaders clearly express the desire for creativity is the prerequisite for subordinates to participate in the creative process. In addition, “Pygmalion effect” tell us the extent to which leaders promote the followers’ creativity may depend on the creativity expectations that leaders set for followers (Tierney and Farmer, 2004). Based on the theory of role expectations, leaders may set different creativity expectations for followers, which are not only a belief about what is the role but also an action to shape the role (Dierdorff and Morgeson, 2007). Leaders will convey different creativity expectations for diverse employees, depending on their innovative capabilities and job requirements. If followers are less capable of performing creatively, or if the work they perform does not include creative requirements, the leader may not convey creativity expectations to such followers. Due to the authority of leaders, especially in countries with high power distance in China and a cultural background emphasizing collectivism, subordinates will pay close attention to what their supervisor expects and take corresponding action. Therefore, subordinates perceive that the higher leader creativity expectations, the more he/she will follow the expectations of the leader and try to fulfill the task and role of creativity, and he/she is more willing to apply cognitive resources to creative thinking activities to realize his/her own creative potential; when leaders exhibit less innovative expectations, employees will think that creativity is not important or irrelevant to themselves or their work, so they will be less likely to be involved in the creative process.

Second, how to establish a high level of team identity and thus urge team members to work together for the collective goal has not been addressed in the literature. According to the theory of the psychological contract (Robinson and Morrison, 1995), creative expectations are the core feature of leader-member relationship. Whether the leader sets up creative expectations for subordinates are the basis of relationship identity. This relationship identity conveys the leader’s concern, value and support for radical creativity, which will affect the employee’s view of value for radical creativity, thereby promoting employees’ radical creativity. Hence, we hypothesized the following:

H1. Leader creativity expectations are positively related to follower radical creativity.
2.2 The mediating role of creative process engagement

However, the precise dynamics of this relationship between leader creativity expectations and follower radical creativity remain under explored. Previous studies were mainly from the perspective of motivation and psychological level. As discussed above, these studies help us to understand the guiding role of leaders in inspiring employee creativity from the psychological level of motivation and willingness.

Previous studies were mainly from the perspective of innovation intention and motivation and lack of attention to the creative process itself. To solve problems creatively, employees not only need to donate and obtain a large amount of information resources but also need to reorganize and optimize the knowledge. If employees do not devote great effort into the creative process, it is difficult to put forward new and practical ideas, because radical creativity, as the superlative form of human intelligence, requires individuals to carry out a series of complex, high-intensity cognitive processing. However, empirical research rarely examined how employee creative process engagement drives creativity.

Due to leaders have the power to assign work tasks and resources, their expectations of follower radical creativity will make employees see radical creativity as role requirements, and therefore internalize leader creativity expectations into employees’ self-creativity expectations, thus promote creative process engagement. Therefore, the higher leader creativity expectations that subordinates perceived, the more he/she will follow the expectations of the leader and try to fulfill the task and role of creativity, and he/she is more willing to apply cognitive resources to creative thinking activities to realize his/her own creative potential. When leaders express less creative expectations, employees will think that creativity is not important or irrelevant to themselves or their work, so they will be less likely to be involved in the creative process.

Follower creative process engagement further raises the possibility of follower radical creativity. Creativity is the result of a process that involves:

- problem identification;
- information searching and encoding; and
- ideas and alternative generation (Gilson and Shalley, 2004; Mumford 2000, Reiter-Palmon and Illies, 2004).

The creative process begins with problem identification (Zhang and Bartol, 2010), where employees must construct problems and identify goals, procedures, constraints and information related to problem-solving (Reiter-Palmon and Illies, 2004). Research shows that the investment in the first stage of the creative process is positively related to the quality and originality of the solution (Reiter-Palmon et al., 1997). The second phase involves information search and a deep understanding of the concepts related to identified problems. Information search and coding include both the consideration of existing concepts and the development of new concepts using information from memory and external information. The time spent on information search and coding is positively correlated with the quality of the solution (Reiter-Palmon and Illies, 2004) and therefore may increase the likelihood of radical creativity. Finally, before choosing the final solution, employees need reorganizes the collected information to form a new understanding, trying to generate new ideas or a series of alternatives, that is, the final stage of creative process; generating creative solutions and selection (Zhang and Bartol, 2010). As Reiter-Palmon and Illies (2004) stated, “creatively solving problems requires extensive and laborious cognitive processing”. If this creative process is not fully implemented (for example, inadequate understanding of a problem,
collection and analysis or too few alternative ideas generated), the quality of final solutions will be affected (Zhang and Bartol, 2010).

As we have pointed out above, the creative process engagement of employees varies. Unlike other work engagement, creative process engagement requires a high level of cognitive ability, which takes a lot of time and effort. If a person pays little attention to a problem and chooses to solve a problem imperfectly, then his or her solution may not be creative and practical enough. On the other hand, when a person gives substantial attention to a problem and chooses to participate fully in the creative process, a radical creative solution will more likely be created – that is, he or she fully aware of the problem from different point, collects diverse but related information and create a variety of alternatives. Hence, radical creativity is more likely to be achieved. Research suggested that incremental creativity means improvements in existing products and processes without the need for new knowledge, producing small improvements through a local search in technology (Herrmann et al., 2006). Compared with incremental creativity, radical creativity needs to break the limits of thinking and develop new ideas to transform and reconstruct the original cognitive-knowledge structure. Employees who are actively involved in this process are more likely to exhibit novel ideas and results (Henker et al., 2015). Therefore, we argue that the degree of employees’ involvement in the creative process further raises the possibility of radical creativity.

Based on the above empirical evidence and reasoning, when leaders clearly express their expectations for follower radical creativity, followers will internalize the leader creativity expectations and devote more time and energy to the process of creative thinking, thus achieving radical creativity. Hence, we hypothesized the following:

\[ H2. \text{ Creative process engagement positively mediates the relationship between leader creativity expectations and follower radical creativity.} \]

2.3 Moderating effect of procedural justice

Leaders and regulations are the main source of influence in the workplace (Prasad and Junni, 2016). Procedural justice concerns about the process of organizational innovation (i.e. the fairness of the processes through which resources are allocated) (Leventhal, 1980). Procedural justice is highly relevant to many work behaviors as it seriously affects employees’ attitudes and behaviors (Colquitt et al., 2001), which can enhance the organizational identity of the employees and be closely related to the development of the organization, thus being regarded as one of the important factors affecting knowledge sharing and cooperation (Cohen-Charash and Spector, 2001; Colquitt et al., 2001). Therefore, based on the perspective of creative process, we choose procedural justice as a moderate variable in the organizational level of creative process, assuming that the procedural justice plays a stimulating role in the process of employees’ work engagement and promote follower creative process engagement in a synergetic way with leader creativity expectations.

Radical creativity is time-consuming and risky for employees (Dewett, 2006), so a high level of procedural justice helps to form a sense of fair treatment, which can contribute to the formation of positive emotions that associated with role play (Bachrach and Jex, 2000). Judge and Ilies (2004) found that when employees are feeling good, they are usually more motivated and creative, which can promote open discussion, debate, mutual inspiration, mutual encouragement and mutual complementation among team members, leading to the resonance of innovative thinking, breaking the limitations of their way of thinking. In addition, as far as organizational support is concerned, because radical creativity requires a
A high level of cognitive skills and requires a lot of resources, high procedural justice helps to supplement the resources consumed by creative process in a timely manner. Employees who receive more support at each stage of the creative process tend to have a higher level of on-the-job performance (Zhang and Bartol, 2010).

On the other hand, procedural justice ensures that employees do not need to spend extra energy or resources to deal with unfair personnel relations, which helps maintain their level of knowledge sharing (Howard and Cordes, 2010). Naumann and Bennett (2000) found that procedural justice is significantly related to employee helping behavior within the organization. In addition, even employees who have suffered unfair treatment may still decide to maintain their level of knowledge sharing or knowledge hiding because they expect that they will receive the necessary support from the organization when the level of procedural justice is high (Lee et al., 2017). In the climate of high procedural justice, employees react more positively to their work (such as organizational commitment and organizational citizenship behavior) (Liao and Rupp, 2005). Roberson (2006) found that procedural justice atmosphere is positively related to the sense of teamwork of employees. Knowledge sharing takes time and effort, so employees may not share their knowledge when they are not supported by the organization. According to multidisciplinary theory, individuals have a clear understanding of key components in the workplace and take different actions based on their perception of each component (Lavelle et al., 2007).

Since knowledge sharing includes the sharing of expertise, unique skills and information, the sense of procedural injustice may lead individuals to protect their remaining resources to avoid further losses. Finally, to deal with procedural injustice, employees may choose discretionary rights, such as knowledge hiding behavior, to conserve resources. Knowledge hiding is not just the opposite of knowledge sharing, which means that employees consciously hide the knowledge that others require (Černe et al., 2017). Procedural justice reflects the support of an organization for the creative process and expresses the organization’s encouragement, respect, reward and recognition for employees who strive to innovate (Zhou and George, 2001). Perceived organizational support theory (POS) holds that employees will increase their work engagement to reward organizations for valuing their contributions (Eisenberger et al., 1986). In addition, when employees confronted with injustice in certain aspects, procedural justice will mitigate the impact of other negative sources (Duffy et al., 2002).

Dansereau et al. (1984) proposed a general model of exchange theory and discussed the role of fairness perception in the progress of leader-follower relationships. They suggested that perceived justice may pose a profound impact on the relationship between leader and follower, thus affecting follower’s attitudes and behaviors. The research of Fugate et al. (2012) shows that employees’ perception of procedural justice is an important factor that determines how employees view organizational change. Studies have shown that procedural justice bring beneficial results to employees and the entire organization (Lee et al., 2017; Johnson et al., 2006). Based on the above reasoning and the previously proposed $H1$ and $H2$, we formulated the following hypothesis:

$H3$. Procedural justice moderates the positive relationship between leader creativity expectations and creative process engagement and enhances the positive indirect effect of leader creativity expectations on follower radical creativity, such that the indirect relationship is stronger under high procedural justice than under low procedural justice.
3. Method

3.1 Sample and data collection

Respondents from university-industry collaborative innovation teams in the field of industrial technology are selected for investigation. We surveyed seven institutions including universities, enterprises and research institutes from Harbin, Beijing and Shanghai. Innovative culture atmosphere is popular in these teams, and creativity is an employee’s in-role behavior. Most of the respondents (94.9 per cent) are engaged in scientific research, with only a small number of human resources personnel and manager supporters, so the sample is suitable for hypothesis testing.

Our survey respondents are all from a team-based organization. Formal and informal exchanges among members of the group are relatively active. Therefore, supervisors can easily obtain information about subordinate actions, and every supervisor who had the opportunity to observe their employees’ creativity behavior was invited to finish the scoring task. Therefore, the sample selection bias in this study is low. Our coordinator gave them detailed instructions on the procedures for completing the investigation and the purpose of the study. Besides, we attached a survey description to each questionnaire and promised the confidentiality of our investigation, with the corresponding certificate number of the supervisor and subordinates in advance so that the reply of each interviewee can match the supervisor or the subordinate.

Taking into account the complexity of paired sampling and the sensitivity of mutual ratings, all questionnaires were processed prior to the survey. To avoid common method biases and potential biases, we made a separate questionnaire for each subordinate and his/her direct supervisor and used upper and lower pairing method to obtain relevant data and distributed it to upper and lower staff and asked one supervisor to complete a questionnaire for only one subordinate. Specifically, the team leader fills in the leadership questionnaire and evaluates the radical creativity of his/her direct subordinate and fills in the personal information. The direct subordinate of the leader fills out the employee questionnaire, including the perceived leader creativity expectations and his/her own creative process engagement, evaluate the level of perceived procedural justice and fills in related personal information.

We distributed a total of 400 leadership questionnaires and 400 employee questionnaires. In the recall questionnaire, there were 295 pairs of data that leaders and employees were able to match up and down. After that, the questionnaires with too many blank and too obvious reaction tendencies were eliminated, and a sample of 256 dyads were collected, yielding an effective response rate of 64 per cent. For the employee sample, 75.13 per cent were male, the average age was 33.72 (SD = 7.84), and the average tenure of employees with their leaders was 4.62 years (SD = 4.27). Besides, males accounted for 91 per cent of supervisors, with an average age of 37.73 years (SD = 6.07) and an average tenure of 8.24 years (SD = 6.31).

To test the non-response bias, we adopted the method of Frazier et al. (2009). We divided the sample into two groups according to the time of collection and compared the variables according to the industry, departmental occupation, employee size and the income level. The double sample t test results show that there is no significant difference between the two (p > 0.1), so there is no need to worry about non-response bias.

3.2 Measurement indicator

The variables in our study include leader creativity expectations, creative process engagement, procedural justice and follower radical creativity. All of the scales used in this study were of high reliability and high validity and were widely validated and approved. The measurement indicators are as follows:
Leader creativity expectations perceived by employees were measured using a four-item scale developed by Carmeli and Schaubroeck (2007). The participants indicated to what extent they agreed or disagreed with the four statements about leader expectations for creativity, using a seven-point Likert scale, with “1-strongly disagree” to “7-strongly agree”. For example, “My direct superiors expect me to be creative in my work,” and “My direct superiors expect me to creatively complete my work”, Cronbach’s alpha was 0.89.

Creative process engagement of employees were measured using a 11-item scale developed by Zhang and Bartol (2010). The questionnaire includes three dimensions: problem identification, information search and coding and creative program generation. Employees scored based on the frequency of each behavior description when he/she faces innovative tasks and problems. To obtain more accurate measurements, we use the seven-point Likert scale, which is from “1-never” to “7-almost always”. For example, “I spend a lot of time to understand the nature of the problem”, “I tried to break through the mindset to come up with new solutions” and so on, Cronbach’s alpha was 0.91.

Procedural justice perceived by employees were measured using a 4-item scale developed by Colquitt et al. (2001). Followers indicated to what extent they agreed or disagreed with the statements about procedural justice, using a seven-point Likert scale, with “1-strongly disagree” to “7-strongly agree”. These included “Is employee outcome appropriate for the work they have completed?”, Cronbach’s alpha was 0.92.

Follower radical creativity were measured using a six-item scale based on the questionnaires used by Madjar et al. (2011) and Baer (2012). Team leaders rated direct subordinates on a seven-point Likert scale, ranging from “1-very atypical” to “7-very typical”, each behavior describes the subordinate’s typical degree of work performance. For example, radical creativity includes “this subordinate proposes ground-breaking ideas – not just making minor changes to existing research, workflow, products, or services,” “this subordinate proposes highly creative ideas”, Coronach’s alpha was 0.87.

3.3 Control variables
On the demographic page of the questionnaire, the follower provided information about their gender (0, “male”, 1, “female”), age (in years), position and the number of years the followers have been working together with their leader. Job position was measured on a scale ranging from “entry level employee” to “upper management or higher position” (5). As our data were collected by team, we also controlled the size of the team. We controlled for these variables because sex was included in recent creativity research (Gong, 2009; Ng and Feldman, 2013).

To better evaluate the relationships between leader creativity expectations, creative process engagement, procedural justice and follower radical creativity, we also controlled transformational leadership, distributive justice and interactional justice to eliminate alternative explanations.

4. Results
We tested our hypotheses through two interrelated steps. First, we used the simple mediation model proposed by Baron and Kenny (1986) for hierarchical regression analysis
(H1 and H2) and use the Bootstrapping test and Sobel test to verify the mediating effect. Second, we used SPSS process to test the moderated mediation role (H3). Through these steps, we demonstrated that the intensity of the mediating effect of the creative process engagement between leadership innovation expectations and radical creativity is conditional on procedural justice (see Tables III and IV).

Before hypothesis testing, we first use AMOS 21.0 to carry out confirmatory factor analysis (CFA) for conceptual model. The analytical results are shown in Table I. The four-factor model has a good fit ($\chi^2$/df = 1.98, CFI = 0.94, NFI = 0.95, TLI = 0.94, RMSEA = 0.05), compared to the three-factor model ($\chi^2$/df = 5.12, CFI = 0.86, NFI = 0.85, TLI = 0.62, RMSEA = 0.13) and the $\chi^2$/df value is significantly improved.

Before regression analysis, we investigated the correlation between the variables through the correlation analysis. Table II shows the mean, standard deviation and correlation coefficients of all variables. The Pearson coefficients are at a relatively reasonable level and show a strong correlation between the variables. Besides, we test the discriminant validity by using Smart PLS 2.0, and we compared the correlations with the square root of the AVE among constructs, and the level proved to be smaller in each case, indicating that there is sufficient discriminative validity among variables. The correlation between variables provides support for our hypothesis testing. Consistent with H1, leader creativity expectations are positively correlated with follower radical creativity ($b = 0.19$, $p < 0.001$), so H1 is supported.

To test the mediating role of the creative process engagement in H2, we adopted the method proposed by Baron and Kenny (1986). The main steps are as follows: first, we should demonstrate independent variable should be significantly related to dependent variable. Second, independent variable also needs to be significantly related to mediator variable. Finally, the mediator should also be significantly related to dependent variable. If these three conditions are met, then at least part of the mediating effect exists. If the independent variable in the third step test are not significantly related to the dependent variable, then there is a complete mediation. The test result of H1 satisfies the first condition of the above intermediary test. Second, the result of significant correlations between leader creativity expectations and creative process engagement satisfy the second condition ($\beta = 0.27$, $p < 0.001$) (Table III). To test the third condition, we use the mediator to perform a regression analysis of the dependent variable and used the independent variable as the control variable. The result indicated that the creative process engagement was significantly and positively related to follower radical creativity ($\beta = 0.16$, $p < 0.05$) and attenuates the effect of leader creativity expectations on follower radical creativity ($\beta = 0.11$, n.s.). Therefore, the results show that the effect of leader creativity expectations on follower radical creativity is conditional on procedural justice.

### Table I. Confirmatory factor analysis

<table>
<thead>
<tr>
<th>Model</th>
<th>Description</th>
<th>$\chi^2$/df</th>
<th>NFI</th>
<th>CFI</th>
<th>TLI</th>
<th>RMSEA</th>
</tr>
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<tbody>
<tr>
<td>Conceptual model</td>
<td>Four-factor model&lt;sup&gt;a&lt;/sup&gt;</td>
<td>1.98</td>
<td>0.95</td>
<td>0.94</td>
<td>0.94</td>
<td>0.05</td>
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<tr>
<td>Model 1</td>
<td>Three-factor model&lt;sup&gt;b&lt;/sup&gt;</td>
<td>5.12</td>
<td>0.85</td>
<td>0.86</td>
<td>0.85</td>
<td>0.13</td>
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<tr>
<td>Model 2</td>
<td>Two-factor model&lt;sup&gt;c&lt;/sup&gt;</td>
<td>8.68</td>
<td>0.64</td>
<td>0.65</td>
<td>0.62</td>
<td>0.25</td>
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<tr>
<td>Model 3</td>
<td>One-factor model&lt;sup&gt;d&lt;/sup&gt;</td>
<td>14.51</td>
<td>0.41</td>
<td>0.42</td>
<td>0.40</td>
<td>0.31</td>
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<sup>a</sup>Four-factors: leader creativity expectations; procedural justice; creative process engagement; and follower radical creativity; <sup>b</sup>Three-factors: leader creativity expectations and procedural justice combined; creative process engagement; and follower radical creativity; <sup>c</sup>Two-factors: leader creativity expectations, procedural justice combined and creative process engagement combined; and follower radical creativity; <sup>d</sup>One-factor: leader creativity expectations, procedural justice combined; creative process engagement and follower radical creativity combined.

Notes: aFour-factors: leader creativity expectations; procedural justice; creative process engagement; and follower radical creativity; bThree-factors: leader creativity expectations and procedural justice combined; creative process engagement; and follower radical creativity; cTwo-factors: leader creativity expectations, procedural justice combined and creative process engagement combined; and follower radical creativity; dOne-factor: leader creativity expectations, procedural justice combined; creative process engagement and follower radical creativity combined.
**Table II. Descriptive statistical analysis of variables**

<table>
<thead>
<tr>
<th>Variable</th>
<th>M</th>
<th>SD</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
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<tbody>
<tr>
<td>Gender</td>
<td>0.25</td>
<td>0.21</td>
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<tr>
<td>Age</td>
<td>33.72</td>
<td>7.84</td>
<td>−0.12</td>
<td>***</td>
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<tr>
<td>Position</td>
<td>2.27</td>
<td>0.79</td>
<td>−0.23</td>
<td>***</td>
<td>0.22</td>
<td>***</td>
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<tr>
<td>Tenure with leader</td>
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<td>4.27</td>
<td>0.05</td>
<td></td>
<td>0.11</td>
<td>***</td>
<td>0.30</td>
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<td>11.83</td>
<td>4.14</td>
<td>0.05</td>
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<td>0.06</td>
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<td>Distributive justice</td>
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<td>0.13</td>
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<tr>
<td>Interactional justice</td>
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<td>0.06</td>
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<td>0.10</td>
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<td>0.09</td>
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<td>5.31</td>
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<td>−0.09</td>
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<tr>
<td>Procedural justice</td>
<td>4.84</td>
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<td>0.11</td>
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<td>0.08</td>
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<td>Creative process engagement</td>
<td>4.96</td>
<td>0.95</td>
<td>−0.12</td>
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<td>0.11</td>
<td></td>
<td>0.11</td>
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<td>0.04</td>
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<td>0.12</td>
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<td>Follower radical creativity</td>
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<td>1.21</td>
<td>−0.09</td>
<td></td>
<td>0.04</td>
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<td>0.07</td>
<td></td>
<td>0.09</td>
<td>0.07</td>
<td>0.10</td>
<td>0.07</td>
</tr>
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**Notes:** N = 256; *p < 0.05; **p < 0.01; ***p < 0.001; a These variables were measured from focal employees; b Managerial rating. Reliabilities are on the diagonal in parentheses.
radical creativity is fully mediated by creative process engagement. In addition, we used Sobel test and Bootstrapping method to test the significance of the mediating role. The two-tailed significance test (assuming a normal distribution) indicates that the indirect effect (indirect effect = 0.04) is significant. Besides, Bootstrapping tests the mediating role of a 95 per cent bias-corrected confidence interval (CI [0.01, 0.09]) by bootstrapping 10,000 samples also confirms the Sobel test. Therefore, the mediating effect of creative process engagement is significant, so H2 is also supported.

H3 predicts that the mediating effect of creative process engagement between leader creativity expectations and follower radical creativity will be enhanced by high procedural justice. The results indicate that the interaction term between leader creativity expectations and procedural justice has a significant effect on creative process engagement (β = 0.15, p < 0.05). To confirm the direction of this interaction term effect, we plotted the simple slopes by conventional procedures at high (M + 1SD) and low (M − 1SD) of procedural justice (see Figure 2). As expected, the positive effect between leader creativity expectations and creative process engagement was strong for employees who assessed procedural justice as high but not significant when the perceived procedural justice is low. We used SPSS Process to test the conditional mediation effect of creative process engagement between
leader creativity expectations and follower radical creativity at high (M + 1SD) and low (M - 1SD) of procedural justice. As proposed in H3, the indirect effect of leader creativity expectations on follower radical creativity is conditional on procedural justice. When the level of procedural justice is high, the indirect effect is strong (indirect effect = 0.06) and significant (p < 0.05, CI [0.02, 0.13]), but it is weak and not significant when procedural justice is low (indirect effect = 0.02, CI [-0.01, 0.07]). Therefore, H3 is also supported.

5. Discussion and conclusions
Radical innovation can help enterprises to achieve the leading position or even monopoly in the short term and form new core competitiveness. Being good at discovering and using external resources is one of the important ways for companies to achieve radical innovation. The R&D department is an important innovation resource for enterprises, and the radical

<table>
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<th>Procedural justice</th>
<th>Conditional indirect effect</th>
<th>SE</th>
<th>95% confidence interval lower limit</th>
<th>95% confidence interval upper limit</th>
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</thead>
<tbody>
<tr>
<td>High (M + 1SD)</td>
<td>0.06*</td>
<td>0.02</td>
<td>0.02</td>
<td>0.13</td>
</tr>
<tr>
<td>Low (M - 1SD)</td>
<td>0.02</td>
<td>0.02</td>
<td>-0.01</td>
<td>0.07</td>
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</tbody>
</table>

Notes: N = 256; Bootstrap sample size =10,000; *p < 0.1; †p < 0.05; **p < 0.01; ***p < 0.001; aEntries are standardized regression coefficients; b Variables are standardized variables.
creativity of R&D personnel is an important way to achieve radical innovation. Research on creativity is rich, but we still know little about the antecedents of radical creativity. The research of creativity is more concerned with the psychological and the motivation level. Leadership and proactive personality are necessary, but it is not enough to produce excellent creativity. It is the main problem to be solved in this article to link it with radical creativity through creative process perspective.

Leaders, as the main influential source in the workplace, play an important role in allocating subordinates’ work resources and predicting their creativity. However, the extant literature still knows little about how strategic leadership promotes follower radical creativity in the context of innovation team from university-industry collaborative innovation. To understand the process of radical perspective in-depth, we investigated the driving mechanism between leaders and followers based on creative process perspective, both personal creative process engagement and the support of organizational procedural justice. We proposed that leaders can affect follower creative process engagement through the psychodynamic mechanism (creativity expectations) between followers and leaders based on role expectations theory.

To this end, we proposed how (through creative process engagement) and when (high procedural justice) leader creativity expectations can affect follower radical creativity and proposed a moderated mediation model. To test the hypothesis, we collected a sample of 256 leader-follower dyads from collaborative innovation teams in China. Hypothesis testing proved that creative process engagement played a fully mediating role between leader creativity expectations and follower radical creativity, and the mediating role is moderated by procedural justice. The indirect effect between leader creativity expectations and follower radical creativity is significant and strong when procedural justice is high. Besides, we strengthened our findings by controlling a range of variables such as transformational leadership. Our research has following interrelated contributions.

First, this study will enrich the literature on radical creativity. Studies on creativity is generally conducted at the level of general creativity of incremental creativity and few research studies concerned about radical creativity. We still do not have enough knowledge about the antecedent of radical creativity, although empirical study show that human
resource practices, cultural change and incremental creativity play an important role in predicting radical creativity (Gil-Marques and Moreno-Luzon, 2013). On the other hand, empirical studies have also shown that transformational leadership has a significantly positive relationship to employee creativity (Qu et al., 2015). Our research narrows this gap in the literature of these two aspects and proved that leader creativity expectations play an important role in stimulating employee radical creativity. Our conclusion is consistent with the findings of QU et al. (2017). Future research can be carried out from two aspects, organizational and personal factors, such as leaders' personal characteristics, employees' regulatory focus and their interactions on employee radical creativity.

Second, the research results of this study demonstrate the key role of creative process in radical creativity. Work engagement has become a potentially important topic in employee performance and innovation management research (Li et al., 2018). Empirical research showed that work commitment not only reflects the positive attitude of employees but also helps improve employee performance (Rezaiamin et al., 2012). The literature on complex systems thinking shows that creativity is the result of blind variation and selective retention process, through which employees execute trial-and-error reconfigurations of creativity antecedents to pursue superior creative solutions (Chen and Kaufmann, 2008). The effect of leader creativity expectations may be better than administrative interference. Few studies have linked leader creativity expectations and creative process engagement in the research of creativity, let alone radical creativity. The model analysis results strongly suggest that creative process engagement plays a mediating role between leader creativity expectations and follower radical creativity. Procedural justice moderates the positive relationship between leader creativity expectations and creative process engagement and the indirect relationship is stronger under high procedural justice than under low procedural justice. This study added elements of organizational procedural justice further improved the perspective of the creative process.

Finally, our study also contributed to the literature of organizational justice. Personal characteristics and perceived working environment factors can interact with each other to generate new behaviors (Regine and Lewin, 2000). Particularly, it is true for those high-tech service-oriented jobs that require employees to donate and receive high quality knowledge to perform their day-to-day job activities (Kaewchur et al., 2013). Scholars regard the perception of procedural justice as a clue that may activate or suppress individual creativity (Fadel and Durcikova, 2014). The model analysis results show that procedural justice positively moderate the indirect effects of leader creativity expectations on employee radical creativity mediated by creative process engagement. The conclusion of our study strongly demonstrate that procedural justice will affect employee's creativity process and then affect employee creativity. However, justice is not a one-dimensional phenomenon and may include different levels of organizational justice in the eyes of employees. But the reason why we separately study procedural justice is because we want to focus on the effect of creative process on the creativity of employees. However, in the future research, we can also examine the differences between procedural justice, distributive justice and other justice.

6. Managerial implications
Our research results have important implications for management practices in the following areas.

First, leadership is an important factor that affects extra-role behavior such as radical creativity. Although organizational creativity is based on knowledge sharing and cooperation, it may not achieve the desired result when team leaders do not clearly convey radical creativity expectations. In addition, due to strategic and operational emergencies,
leaders can deliberately set role expectations for subordinates to achieve efficiency goals or creative goals. For example, organizations can develop and provide leadership training courses or tutorials and impart psychological implied skills to supervisors so as to enhance employees’ perceived leader creativity expectations.

Second, our research results show that the importance of creative process engagement in radical creativity. Creativity is not a sudden whimsy but based on the accumulation of knowledge and information (Li and Sandino, 2018). Therefore, radical creativity requires the extensive and in-depth learning of employees. However, the valuable human asset also depends on leadership (Junquera and Brio, 2017). Supervisors should realize that there is no perfect fixed way to promote employee creativity, especially radical creativity. Compared with the traditional management practices emphasizing planning, leaders encourage trial practice, provide enough time to ensure employees fully identify problems and provide resources to facilitate information search and coding, may achieve better results.

In addition, it is necessary for organizations to try to enhance the procedural justice. As our research shows, organizations should place greater emphasis on the procedural justice, thereby enhancing the positive impact of other factors on radical creativity. The organization is mainly composed of personnel and rules. In addition to the leading role of supervisors, the support provided by the rules and regulations of an organization is also important for employee creativity. Highly perceived procedural justice can help trigger positive spirals of team interaction, including increasing team cohesion and reducing team exclusivity. For example, organizations can establish a cultural atmosphere that highlights procedural justice. Therefore, the organization is encouraged to support and strengthen employees’ understanding of procedural justice in different forms. This can reduce negative consequences caused by employees’ negative views on procedural injustice. The leaders and other representatives of the organization should receive training to distinguish the different forms of organizational justice and their different and specific impacts on the development of the organization, which can help them identify the most important contributors in the organization and can design future organizational and human resource policies accordingly.

7. Limitations and further research
Our study has several limitations that can be solved in future studies.

First, the design of research limits our ability to infer causality. Creative process engagement is a kind of work engagement and may take time to show results. Compared with the longitudinal method, cross-sectional study method is difficult to draw the causal relationship between variables, so the follow-up study can adopt longitudinal method. Besides, non-response bias is a typical problem in the investigation. Baruch and Holtom (2008) found that the average response rate of questionnaires sent by e-mail was 54.7 per cent (SD = 23.9) and future research should consider the quality of research improved by using lossless methods.

Secondly, the ratings of leader creativity expectations, creative process engagement and procedural justice are obtained from the same source. Therefore, we cannot completely exclude common method bias. We try to minimize the potential problem by measuring follower radical creativity with different sources, thereby improving the objectivity of the data. In addition, the common method bias is unlikely to be a significant reason for interaction (Schaubroeck and Jones, 2000). Therefore, we argue that the main findings of this study are not affected by common method bias, but it is helpful to study from different perspectives, and the future research can evaluate creative process engagement of each subordinate from the perspective of the supervisor.
Third, the samples used in this study were mainly from the university-industry collaborative innovation teams in the field of engineering technology in China, and the employees engage in scientific research in a relatively single cultural context. We are not sure what extent our research results can be extended to other industries in China or western culture. Although more and more organizational behavior studies have been carried out in China, the results are similar to those in the West (Kirkman et al., 2009), but the influence of cultural atmosphere on the research results still cannot be ignored. For example, as a country with a relatively high-power distance, Chinese employees are generally more reluctant to take active and challenging actions. Therefore, the role given to leaders in promoting radical creativity for employees may be very different in oriental society and western society. Therefore, the connotation of leader creativity expectations and procedural justice may be completely different.

References


Further reading


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