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The influence of leadership on product and process innovations in China: The contingent role of knowledge acquisition capability

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ABSTRACT

Building upon upper echelon theory and a dynamic capability perspective, this study investigates the relative effectiveness of two types of leadership on product and process innovations in emerging economies. The authors found that in China transformational-charismatic (TC) leadership has a stronger effect on product innovation, while transactional leadership has a stronger effect on process innovation. The authors further study the boundary conditions of leadership and empirically examine the contingent effects of organizational level capability on the relationships between leadership and innovation. The moderating effects are intriguing: knowledge acquisition capability strengthens the effect of TC leadership on process innovation and that of transactional leadership on product innovation. However, knowledge acquisition capability attenuates the positive relationship between TC leadership and product innovation as well as the positive relationship between transactional leadership and process innovation.

1. Introduction

Innovation is widely regarded as a powerful driver of competitive advantage and business growth (Ar & Baki, 2011; Dess & Picken, 2000), particularly in markets characterized by rapid technological change, dynamic uncertainty and intense competition (Hult, Hurley, & Knight, 2004). Firms seek to survive and grow through innovation, especially in emerging economies (Iyer, LaPlaca, & Sharma, 2006). The fact that the Chinese government considers innovation-oriented development as a key strategy to modernize its economy underscores the importance of innovation in China. Effective leadership facilitates innovation and competitiveness, and is regarded as an important driver of sustainable business growth in emerging markets (Chen, Lin, Lin, & McDonough, 2012). In Chinese firms, leaders play a critical role in the success of their organizations because they are more autocratic and powerful than business leaders in developed countries (Casimir & Waldman, 2007). Therefore, it is important to examine how leadership influences business innovation in China.

Existing studies have examined the antecedents of innovation primarily through three theoretical lenses: leadership quality by the upper echelon theory; managerial factors by the dynamic capability theory; and the business process by process theory (Crossan & Apaydin, 2010). A close examination reveals several limitations in this literature on innovation.

First, existing studies are mainly focused on identifying the determinants of product or service innovation (Atuahene-Gima, 1995; Zhou & Wu, 2010). Despite the fact that a firm's competitive advantage over time depends on both product and process innovations, less attention has been given to the dynamics of process innovation (Damanpour & Gopalakrishnan, 2001). Product innovation refers to the new products or services introduced into the market for the purpose of satisfying customers' wants and needs (Barras, 1986), while process innovation refers to new elements (e.g. new management approaches, production methods and new technologies) introduced into organizations' production and management operations (Ettlie & Reza, 1992; Gopalakrishnan, Bierly, & Kessler, 1999). As the outcome of process innovation is less tangible and less visible to customers, firms tend to overlook the critical role of process innovation (Gopalakrishnan et al., 1999). However, process innovation is just as important to an organization's success as product innovation. On the one hand, process innovation enhances a firm's ability to exploit, maximize, and reconfigure resources and capabilities (Gopalakrishnan et al., 1999), which makes it a critical source of competitive advantage. On the other hand, both product and process innovations have significant implications on a firm's marketing strategy (Gopalakrishnan et al., 1999). While product innovation supports market differentiation strategies, process innovation reduces costs and enhances production efficiency. Given the importance of both types of innovation, we employ a comprehensive perspective by simultaneously examining product innovation and a relatively under-researched form of innovation, process innovation.

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Second, although both transformational and transactional leadership enhance innovation (e.g., Eisenbeiss, van Knippenberg, & Boerner, 2008; Elenkov & Manev, 2005; Gumusluoglu & Ilsev, 2009; Howell & Avolio, 1993), their effectiveness on product and process innovations may differ. Transactional leaders attempt to enhance innovation and manage leader–follower relationships by focusing on exchanges and contingent reward behavior, and by paying close attention to deviations, mistakes, and corrective actions (Bass, 1985; Waldman, Ramirez, House, & Puranam, 2001). Transformational leadership is a style of leadership in which leaders aim to inspire followers by appealing to their high-level needs for self-actualization (Bass, 1985; Vaccaro, Jansen, Van Den Bosch, & Volberda, 2012). Therefore, transformational leadership may stimulate product innovation more effectively than transactional leadership because employees working under a rewards-and-punishment regime (transactional leadership) tend to pursue short-term goals while overlooking the long-term benefits of innovation (Jansen, Vera, & Crossan, 2009). However, transactional leadership may more effectively enhance process innovation by creating an environment of open communication and by increasing employees' compliance with decisions (Elenkov & Manev, 2005; Yukl & Heaton, 2002). Previous studies focus mainly on the effect of transformational leadership on organizational innovation (Chen et al., 2012; García-Morales, Jiménez-Barrionuevo, & Gutiérrez-Gutiérrez, 2012). This study adopts a comparative approach and clarifies the relative contributions of the two types of leadership on product and process innovations.

Third, both transformational leadership and transactional leadership motivate employees to innovate, with the former stimulating creative behavior (Gumusluoglu & Ilsev, 2009; Jung, 2001) and the latter encouraging compliance behavior (Elenkov & Manev, 2005). Despite the significant influence of leadership on innovation, the single lens of upper echelon theory cannot fully explain the dynamics of innovation (Crossan & Apaydin, 2010; West, 2002). New ideas and knowledge generated by employees are necessary but may not be sufficient for innovation, as successful product development also relies heavily on critical knowledge from the external environment to interpret, deploy, and perfect the existing knowledge base (Verona, 1999). An organization's ability to obtain and utilize external knowledge plays an important role in influencing strategy and performance in an emerging market (Aragón-Correa, García-Morales, & Cordón-Pozo, 2007), because firms in emerging markets often lack the experience or knowledge base to create new knowledge internally. As Ellonen, Jantunen, and Kuivalainen (2011) point out, the ability to innovate is idiosyncratic and firms with stronger capabilities are better able to make use of external knowledge in their internal operations and innovation activities. We thus investigate the role of knowledge acquisition capability, a firm's ability to acquire external knowledge, as a moderator of the leadership-innovation link (Crossan & Apaydin, 2010).

Drawing upon the limitations and the unique characteristics of the Chinese marketplace and commercial organizations in China, we develop a conceptual framework (see Fig. 1) that depicts the interplay between leadership and organizational knowledge acquisition capability. Based on the upper echelon (Hambrick & Mason, 1984) and dynamic capability theories (Teece, Pisano, & Shuen, 1997), we first distinguish between process and product innovations and test the impacts of leadership on them independently. Then we examine the relative effectiveness of transactional and TC leadership on the two types of innovation. Finally, we assess whether the effects of leadership on innovation are contingent on an organization's knowledge acquisition capability. Taken together, this study offers deeper understanding of organizational innovation by examining the relative effectiveness of the two types of leadership and by delineating the boundary condition of their influences on product and process innovations.

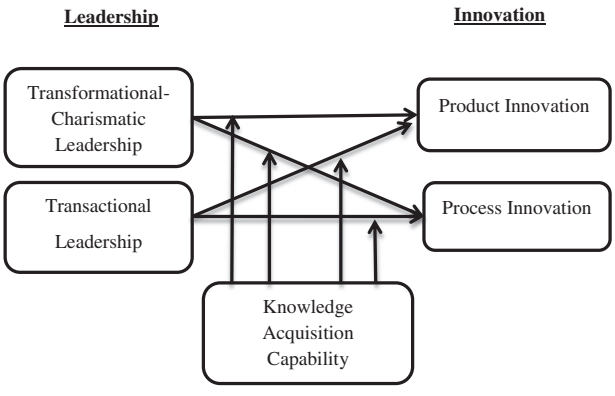

Fig. 1. Conceptual framework.

2. Literature review

Schumpeter defined innovation as "the reflection of novel outputs of a new good, a new method of production, a new market, a new source of supply, or a new organizational structure" (Schumpeter, 1934), and suggested that innovation can be classified as product, process or business model innovation. Recently Crossan and Apaydin (2010) developed a comprehensive typology for innovation and refined the definition of innovation as "production or adoption, assimilation, and exploitation of a value-added novelty in economic and social spheres; renewal and enlargement of products, services, and markets; development of new models of production; and establishment of new management systems. It is both a process and an outcome (p. 1155)."

Based on various dimensions of organizational innovation (i.e., type, magnitude, and form), innovation can be categorized as either technological and administrative innovation, radical exploratory and incremental exploitative innovation, or product/service, process and business model innovation (Gopalakrishnan & Damanpour, 1997; Gopalakrishnan et al., 1999; Rosenkopf & Nerkar, 2001). We choose to differentiate innovation in terms of its form and focus on product and process innovations. Over time, a firm's competitive advantage depends upon both product and process innovations (Damanpour & Gopalakrishnan, 2001). Process innovation involves a focus on increasing production efficiency, improving product quality and introducing new production methods. Product innovation receives considerable research attention as it is critical to business success (Danneels & Kleinschmidtb, 2001; Henard & Szymanski, 2001). Compared to product innovation, process innovation receives less attention because its outcomes are less tangible and less visible to consumers.

2.1. Product and process innovations

Product innovation is seen in new outputs or services that are introduced for the benefit of customers, and it is perceived as the most critical factor contributing to a firm's competitive advantage (Casadesus-Masanell & Zhu, 2012; Gopalakrishnan & Damanpour, 1997; Li & Atuahene-Gima, 2001; Paladino, 2008; Vaccaro et al., 2012). Process innovation includes new tools, devices, and knowledge inputs that enable production and management operations. We believe that process innovation is an equally important driver of competitive advantage. First, process innovation involves the introduction of new production methods, new management approaches, and new technologies that can improve production or management processes (Damanpour & Gopalakrishnan, 2001; Gopalakrishnan et al., 1999) and contribute to an organization's efficiency (Utterback & Abernathy, 1975). Second, process innovation helps an organization exploit its resources and capabilities and also recombine and reconfigure its resources and capabilities for production improvement or newness (Gopalakrishnan et al., 1999).

Product innovation and process innovation differ in three important ways. First, their respective strategic foci differ. Product innovation targets the market and is primarily customer-driven (Utterback &

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Abernathy, 1975). Process innovation, however, focuses on improvements in tools, devices, and knowledge through technologies that mediate between inputs and outputs (Gopalakrishnan & Damanpour, 1997). Consequently, it is an internal activity and is primarily efficiency-driven (Utterback & Abernathy, 1975). Given these different strategic foci, product innovation is more visible to the organization and to consumers, whereas process innovation is less tangible and less apparent to stakeholders (Gopalakrishnan et al., 1999). Second, the two types of innovation differ in how they support business strategies (Butler, 1988; Porter, 1991). A differentiation strategy which focuses on superior product performance is best supported with a focus on product innovation. On the other hand, a low-cost strategy may be best supported with a focus on process innovation.

Third, the two types of innovation are associated with different knowledge characteristics. Process innovation is associated with internal and systematic knowledge, while product innovation is associated with external and autonomous knowledge (Gopalakrishnan & Bierly, 1997). Based on these differentiating characteristics, Gopalakrishnan et al. (1999) suggested that knowledge related to process innovation is more tacit and complex and therefore more difficult to understand and imitate than knowledge related to product innovation. Product innovation is usually easier to understand and can be observed in the external environment (Von Hippel, 1988). Product innovations are generally more apparent to customers, and therefore may require firms to incorporate customer feedback into the design and manufacture of products (Utterback & Abernathy, 1975).

2.2. Transformational and transactional leadership

Upper echelon theory essentially argues that a firm is a strong reflection of its top management team, and this team influences organizational outcomes (Hambrick & Mason, 1984). In other words, top executives influence firm outcomes by acting on the basis of their personal interpretations of the strategic situations that they face, which in turn are derived from their experiences, values, and personalities. Transactional leadership and transformational leadership are two well recognized leadership styles. Transactional leadership has generally been conceptualized as a cost/benefit exchange process because the leader–follower relationships are based on a series of exchanges and rewards. In this leadership model, leaders clarify expectations and reward subordinates when goals are achieved (Bass, 1985). By providing external rewards, transactional leaders motivate subordinates to achieve expected performance goals. Close monitoring of subordinates' behaviors and prompt corrective actions are characteristics of transactional leadership (Bass, Avolio, Jung, & Berson, 2003). Transactional leadership enhances innovation by encouraging employees' compliance behavior in support of the leader's innovation-relevant decisions (Elenkov & Manev, 2005; Yukl & Heaton, 2002).

By contrast, leaders who adopt a transformational leadership model aim to inspire followers to do more than expected. Such leadership involves active emotional relationships between leaders and followers (Avolio & Bass, 1988; Bass, 1985, 1990). Charisma is a key leadership attribute that followers perceive and react to (Conger, 1999). As charisma is a core component of transformational leadership (Bass, 1985; Joy & Sherry, 2003), we focus on charismatic leadership in this study. This treatment is a common approach in the literature, which examines charismatic leadership as a key dimension of transformational leadership (Waldman, Javidan, & Varella, 2004; Waldman, Siegel, & Javidan, 2006; Waldman et al., 2001).

Transformational-charismatic leadership (hereafter TC leadership) involves a personal connection between leaders and their followers which goes beyond an exchange based on rules and regulations (Yammarino, Dubinsky, Comer, & Jolson, 1997). A charismatic leader articulates an inspirational goal based on vision, values, and beliefs; communicates high performance expectations; and inspires followers to achieve goals (Waldman et al., 2004, 2006). More importantly, TC leaders are capable of transforming followers' self-concepts and achieving motivational outcomes by changing their followers' perceptions of the nature of their work, offering an appealing future vision, developing strong collective identity among followers and enhancing both individual and collective self-efficacy (House, 1977). TC leaders are able to inspire their employees to explore new technologies and innovative ideas (Chen et al., 2012; García-Morales et al., 2012; Gumusluoglu & Ilsev, 2009; Kozinets, 2001). They provide inspiration by motivating their followers, mainly through communication of high expectations and stimulation of people's intelligence, knowledge, and learning ability (Bass, 1990; Bass et al., 2003). Transformational leadership also stimulates employees' creativity (Bass et al., 2003), team innovation (Eisenbeiss et al., 2008), and job performance (Gong, Huang, & Farh, 2009; Howell & Avolio, 1993).

While the relationship between TC leadership and organizational innovation has been established (Chen et al., 2012; Jung, Chow, & Wu, 2003; Matzler, Schwarz, Deutinger, & Harms, 2008), the relationship between transactional leadership and innovation is inconclusive. On the one hand, transactional leadership helps encourage followers' compliance behavior in support of innovation-relevant decisions (Elenkov & Manev, 2005; Yukl & Heaton, 2002). On the other hand, some empirical studies fail to support the relationship between transactional leadership and innovation (Jung, 2001; Jung & Avolio, 2000; Pieterse, van Knippenberg, Schippers, & Stam, 2010). The inconsistent findings may be partially explained by delineating the boundary condition of leadership. We propose that the effects of two types of leadership on product innovation and process innovation are contingent on knowledge acquisition capability.

3. Hypothesis development

3.1. Transformational-charismatic (TC) leadership and innovation

Leadership is considered to be one of the most important factors affecting innovation because leaders not only influence organizational characteristics such as culture, strategy, structure, reward systems, and resources (Mumford, Scott, Gaddis, & Strange, 2002), but also motivate creativity in their followers (Gumusluoglu & Ilsev, 2009; Jung, 2001). Moreover, leaders can help create a supportive environment for creativity and innovation and increase creative performance through compensation and other resource-related policies (Jung et al., 2003).

TC leadership promotes organizational innovation (i.e., product and process innovation in our study) in two significant ways. First, TC leadership increases employees' intrinsic motivation to engage in innovative activities (Jansen et al., 2009). TC leaders not only coach and mentor their employees, but also help develop employees' commitment to the organization's long term goals, mission, and vision (Waldman & Bass, 1991). Specifically, TC leaders inspire subordinates to transcend their self-interests for the sake of the organization by linking an individual's identity to the collective identity (Eisenbeiss et al., 2008). They also help build self-confidence, self-sufficiency, and self-esteem in employees (Bass, 1990). TC leaders who engage in creative and unconventional activities serve as role models for employees and show strong confidence in their employees' ability to out-perform (Howell & Avolio, 1993; Waldman & Bass, 1991). Thus, employees are intrinsically motivated to support the organization's innovation strategies through their own creativity (Tierney, Farmer, & Graen, 1999). Strong motivation and self-esteem in employees help enhance organizational innovation (Mumford et al., 2002).

Second, TC leaders enhance subordinates' potential to develop new ideas and perform innovative activities (Bass & Avolio, 1990). TC leaders help develop employees' innovation potential by stimulating them to "think outside the box" and to adopt critical thinking or innovative approaches to their work (Bass & Avolio, 1994; Sosik, Kahai, & Avolio, 1998). Specifically, TC leaders encourage employees to think about old problems in new ways, increase their willingness to perform beyond

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stated expectations, and challenge them to adopt innovative approaches at work (Bass, 1990; Howell & Avolio, 1993). Therefore, we propose that:

H1. In emerging economies, TC leadership has a positive effect on (a) product innovation and (b) process innovation.

3.2. Transactional leadership and innovation

Transactional leadership is regarded as an exchange process in which leaders specify behavior and performance standards and reward or punish subordinates who are out of compliance with those standards. They closely monitor followers' behaviors and take corrective actions for deviance, mistakes, and errors when they occur (Bass, 1985). Exchange relationships are based on contracts which involve positive reinforcement for a higher level of performance (Avolio & Bass, 1988). In general, transactional leadership gives employees extrinsic motivation to engage in innovative activities through rewards and punishment (Bass, 1985; McMeekin & Coombs, 1999).

First, transactional leaders can use rewards to encourage employees' innovative efforts. For example, leaders can clearly specify the process and product innovation objectives of the company, and employees will work toward these goals based on the understanding that they will be rewarded if they achieve expected performance outcomes. Such positive reinforcement and goals/objectives clarification will have a positive effect on organizational innovation. As long as leaders and employees find the exchange mutually rewarding, the exchange relationship is likely to continue and the expected performance outcomes will be achieved (Gatignon & Anderson, 1988). Previous research has shown that transactional leadership has a positive effect on employee performance (Bradford & Sherry, 2013; Judge & Piccolo, 2004). Second, even though the exchange relationship between leaders and employees is deemed as contractual, transactional leaders provide immediate feedback to employees (Podsakoff, Todor, Grover, & Huber, 1984), and the resulting close working relationship promotes employees' innovation activities and encourages cooperative behaviors. Consequently, transactional leaders not only set goals and expectations for employees to follow, but also use rewards and feedback to extrinsically motivate employees to innovate. Taken together, we hypothesize that:

H2. In emerging economies, transactional leadership has a positive effect on (a) product innovation and (b) process innovation.

3.3. The relative effectiveness of TC and transactional leadership on innovation

Both TC and transactional leaders stimulate employees to perform according to their expectations. The former provides intrinsic motivation and the latter uses extrinsic motivation to persuade employees. In other words, TC leaders gain employees' compliance by inspiring, empowering, and coaching, whereas transactional leaders gain compliance through rewards (Matzler et al., 2008). Product innovation is a risky and often long-term goal (Crossan & Apaydin, 2010). It requires employees to have intrinsic motivation as well as confidence and patience to concentrate on activities that contribute to product innovation. TC leadership can enable employees to live up to their full potential to accomplish goals more effectively than transactional leadership (Matzler et al., 2008), which is critical to achieving product innovation.

Transactional leaders, on the other hand, provide rewards and punishment, monitor employees' behavior, and give timely feedback. External rewards imparted by transactional leaders can better motivate employees to perform activities that contribute to process innovation because process innovation is a relatively simpler and less risky goal. Employees who demonstrate process innovation behaviors are able to achieve such goals and garner the associated rewards. However, product innovation is a more risky and long-term goal. Extrinsic motivation may be not strong enough to sustain employees engaged in product innovation activities because they may be unable to achieve their goals in a limited time span. Taken together, we propose:

H3a. In emerging economies, TC leadership has a stronger positive effect on product innovation than transactional leadership.

H3b. In emerging economies, transactional leadership has a stronger positive effect on process innovation than TC leadership.

3.4. Contingent effects of knowledge acquisition capability

3.4.1. Transformational-charismatic leadership

Knowledge acquisition capability refers to a firm's ability to identify and acquire new knowledge from external sources (Zahra & George, 2002). According to the dynamic capability view, dynamic capability refers to an organization's ability to purposefully create, extend, or modify its resource base (Helfat, Finkelstein, Mitchell, Singh, & Teece, 2007; Teece et al., 1997). Knowledge acquisition capability is one such capability that is recognized as a key factor for organizational success (Lane, Salk, & Lyles, 2001; Zhou & Xu, 2012). It helps firms spot, interpret, and pursue opportunities in the environment as well as obtain and accumulate external knowledge (Cui, Griffith, & Cavusgil, 2005; Zahra & George, 2002).

According to contingency theory (Venkatraman, 1989), the interactive fit argument or “fit-as-moderation” proposes that a firm's performance is attributable to a match between its strategic behaviors and the internal and external environmental conditions. Knowledge acquisition capability is a firm's internal source that influences organizational performance by sensing opportunities and configuring resources, processes, and routines (Eisenhardt & Martin, 2000; Wu & Chen, 2012). We propose knowledge acquisition capability interacts with leadership style to influence product and process innovation. A firm's knowledge acquisition capability helps the firm to identify new information and acquire valuable external knowledge, which may enable it to better implement an innovation strategy and execute the innovation initiatives of its leaders (Cohen & Levinthal, 1990).

Knowledge acquisition capability strengthens the role of TC leadership in promoting both product and process innovations. First, TC leaders are able to inspire employees' creative potential to a great extent by providing intrinsic motivation (Bass & Avolio, 1994). Knowledge acquired from the external environment gives substantial support to employees' creative behavior because new customer and market knowledge further broaden employees' perspectives which help deepen their thinking and advance their innovative tendencies. In addition, employees are able to mirror critical thinking skills and innovative approaches by emulating TC leaders (Bass & Avolio, 1994; Sosik et al., 1998). Strong knowledge acquisition capability helps firms obtain and accumulate external knowledge and also helps employees expand their knowledge bases. The integration of new internal and external knowledge greatly amplifies employees' creative potential and thereby contributes to a firm's innovative performance. Therefore, we propose that:

H4a. In emerging economies, knowledge acquisition capability strengthens the role of TC leadership on product innovation.

H4b. In emerging economies, knowledge acquisition capability strengthens the role of TC leadership on process innovation.

3.4.2. Transactional leadership

Successful product development relies on input from the external environment to interpret, deploy, and perfect internal knowledge resources (Verona, 1999). External knowledge acquired not only expands a focal firm's knowledge base (Ahuja & Katila, 2001), but also enables

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firms to better utilize existing knowledge. Moreover, as mentioned earlier, the acquisition of customer feedback and external information is crucial to product innovation. Knowledge acquired from the external environment helps employees deepen their thinking and advance their innovative ideas. It is a valuable resource that helps employees accomplish organizational goals and garner rewards from transactional leaders. Thus by making the goals more achievable and less risky, employees are motivated to work hard to reach the goals of product innovation. Therefore, we argue that:

H5a. In emerging economies, knowledge acquisition capability strengthens the positive relationship between transactional leadership and product innovation.

Knowledge acquisition capability helps focal firms continually renew their knowledge stock (Jansen & Volberda, 2005). However, new external knowledge does not always benefit an organization (Ahuja & Katila, 2001). The new knowledge searching behavior challenges the efficiency orientation of transactional leadership because transactional leaders tend to encourage employees to improve the efficiency of existing routines (Bass, 1985). Knowledge acquisition capability helps expand the scope of information beyond the existing knowledge base (Zhou & Li, 2012). Externally acquired knowledge may disrupt the established routines, thereby diminishing productivity (Jemison & Sitkin, 1986). Taken together, we propose the following:

H5b. In emerging economies, knowledge acquisition capability attenuates the positive relationship between transactional leadership and process innovation.

4. Methods

4.1. Data collection procedures

We chose manufacturing firms in China as our empirical setting. China provides a rich context for this study for two reasons. First, the country's complex and dynamic transitional environment forces innovation to take place at an unprecedented pace (De Luca & Atuahene-Gima, 2007; Zhou & Wu, 2010). To survive and maintain a competitive advantage, firms must not only exploit their existing knowledge base but also continually integrate and develop new knowledge (Li, Zhou, & Shao, 2009; Zhou & Wu, 2010). Therefore product and process innovation are both important for Chinese firms. Second, Chinese managers exhibit a high degree of power distance because of the traditional Confucian focus on hierarchy. Chinese managers tend to be more autocratic than managers in developed countries (Casimir & Waldman, 2007). Hence, leaders in China play a critical role in determining the success of their organizations.

Our survey questionnaire was developed in English and then translated into Chinese. It was checked for accuracy using a conventional back-translation process. To examine the face validity and assess informants' understanding of the survey items, we collected feedback and comments from a pretest group of twenty senior managers. The final questionnaire used in the survey was in Chinese.

We collected our data through face-to-face onsite interviews. A sample of 800 manufacturing firms was randomly selected from a directory provided by a reputable market research firm. We first contacted these firms via telephone using trained interviewers to solicit cooperation and to identify key informants. Of the 800 manufacturing firms contacted, we successfully interviewed 285 firms, as some key informants were either unwilling or unavailable to participate in the study. After eliminating responses with extensive missing values, we obtained 277 usable questionnaires, a response rate of 34.6%. A comparison of respondents and non-respondents in terms of the number of employees and sales volume revealed no significant differences, indicating that there is no evidence of non-response bias. After the fieldwork, one of the authors randomly called thirty respondents to confirm that the interviews had been conducted and found no evidence of cheating in the fieldwork. On average, the informants had ten years of industry experience and 6.6 years of duration in their firm, which indicates that our informants are knowledgeable about both their firm and their industry. The average age of these manufacturing firms was 13.1 years; the average employee count was 236; and the majority are privately owned companies (67.4%).

4.2. Common method bias

As with all self-reported data, it is imperative to address the issue of common method bias (CMB). Several approaches have been used to mitigate the possibility of CMB in this study (Malhotra, Kim, & Patil, 2006; Podsakoff, MacKenzie, Lee, & Podsakoff, 2003). First, we took procedural remedies to avoid CMB by reducing item ambiguity and protecting respondent confidentiality. We then adopted statistical analyses to assess the severity of CMB. First, we conducted Harmon's one factor test on all of the latent variables, extracting six factors that accounted for 63.4% of the total variance, with the largest factor explaining only 14.5% of the total variance, indicating that CMB is not a major concern in this study (Podsakoff & Organ, 1986). Second, we applied the "MV" marker method and chose a scale unrelated to at least one measurement in the study as the MV marker. This scale offered a proxy for common method variance (Lindell & Whitney, 2001). We used a three-item scale that measured the reciprocity between the firm and its customer firm (Muthusamy & White, 2005) (Cronbach's $\alpha = .91$) and selected the lowest positive correlation ($r = .01$) between the MV marker and the other variable. All of our significant correlations remained significant after the partial correlation adjustment (see Table 1), suggesting that common method bias is not a concern in our study.

4.3. Measures

We adapted measures of transformation-charismatic leadership from Den Hartog, De Hoogh, and Keegan (2007). The scale primarily measures employees' perceptions of a leader's charisma. Items were rated on a seven-point scale ranging from one (not at all) to seven (very much so). We adopted measures of transactional leadership from Hartog, Van Muijen, and Koopman (1997), which focus on contingent rewards and punishments. Under this type of leadership, rewards and punishments are contingent upon effort expended and performance level achieved. The measures for product innovation are adopted from Paladino (2008), which ask the respondents to evaluate features of the firm's new products or services introduced to the market. We adopted the measures of process innovation from Wang & Ahmed (2004). The four items measure the extent to which an organization's new elements (e.g., new management approaches, production methods, and new technologies) are introduced into its production and management operations. The moderating variable, knowledge acquisition capability, is measured with a four-item scale from Jansen, Van Den Bosch, and Volberda (2005) which gauges the organization's capability to acquire knowledge from the external environment.

To account for the influence of extraneous effects, we included firm size, firm age, industry type, and technological turbulence as control variables. We measured firm size as a logarithm of the number of employees. We created a dummy variable to measure industry type (high-tech industry = 1; non-high-tech industry = 0). We measured firm age as the number of years that the firm has been in operation. We used items adopted from Jaworski and Kohli (1993) to measure technological turbulence, as this is recognized as an important factor that impacts firm innovation (Zhou & Wu, 2010).

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Table 1
Descriptive statistics and correlations.

		1	2	3	4	5	6	7	8	9
1	Firm age		.36**	−.12*	−.01	−.02	.03	.08	−.04	−.03
2	Firm size	.37**		.00	−.04	−.04	−.04	.08	−.07	.03
3	Industry type	−.11	.01		−.07	−.13*	−.13*	−.20**	−.11	−.21**
4	Technological turbulence	.00	−.03	−.06		.30**	.47**	.38**	.45**	.42**
5	Knowledge acquisition capability	−.01	−.03	−.12*	.31**		.54**	.42**	.46**	.52**
6	TC leadership	.04	−.03	−.12*	.48**	.54**		.58**	.65**	.55**
7	Transactional leadership	.09	.09	−.19**	.39**	.43**	.58**		.45**	.58**
8	Product innovation	−.03	−.06	−.10	.46**	.47**	.65**	.46**		.43**
9	Process innovation	−.02	.04	−.20**	.43**	.52**	.55**	.58**	.44**	
10	Marker variable	.13*	.13*	−.23**	−.01	.01	.13*	.08	.09	.07
	Mean	12.00	236.13	0.16	5.40	5.14	5.42	5.42	5.33	5.34
	Standard deviation	11.13	291.42	0.37	0.83	0.81	0.85	0.72	0.82	0.75

Note: *$p < .05$; **$p < .01$ (two-tailed); N = 277. Zero-order correlations are below the diagonal; MV adjusted correlations for potential common method variance are above the diagonal.

4.4. Construct validity

We followed a three-step approach to assess the reliability and validity of the six latent variables. First, we conducted exploratory factor analysis and obtained six factors. We checked Cronbach's alpha coefficient to measure the reliability: the Cronbach's coefficient of transformation-charismatic leadership is 0.88; transactional leadership is 0.76; product innovation is 0.87; process innovation is 0.79; knowledge acquisition capability is 0.73, and technological turbulence is 0.79. Second, we subjected all measurement items to a confirmatory factor analysis using AMOS. The measurement model fits the data satisfactorily ($x^2_{(299)} = 423.31$, $p < .001$; goodness-of-fit index [GFI] = 0.90; comparative fit index [CFI] = 0.96; incremental fit index [IFI] = 0.96; root mean square error of approximation [RMSEA] = 0.04). In addition, all factor loadings are highly significant ($p < 0.001$) and the composite reliabilities of all constructs are greater than 0.70.

Third, we assessed the discriminant validity of all six latent constructs with chi-square difference tests. The test was performed for one pair of factors at a time. For example, for the pair of TC leadership and transactional leadership, we compared the fit of the restricted model (correlation fixed to one) with that of a freely estimated model (correlation estimated freely). The differences between each pair are all significant ($p < 0.001$). Overall, these results indicate that the measures possess adequate reliability and validity. The Appendix A reports the measurement items for each construct, standardized factor loadings, Cronbach's alpha coefficient, and composite reliability. All the measures demonstrate satisfactory psychometric properties. In Table 1, we present the basic descriptive statistics and the correlations of the constructs.

5. Analysis and results

Because the proposed model contains interaction terms between leadership and knowledge acquisition capability, we used hierarchical moderated regression analyses to test the hypotheses. In order to cope with the potential threat of multicollinearity in the regression models, we mean-centered all independent variables and the moderator to create interaction terms (Aiken & West, 1991; Belsley, 1984). The use of the mean-centering technique in reducing essential collinearity in moderated multiple regression analysis is debatable (Echambadi & Hess, 2007). Some scholars argue that the mean-centering technique can not only enable model convergence (Lee, Song, & Poon, 2004), but also facilitate the interpretation of path coefficients without altering the form of relationship and results (Echambadi & Hess, 2007). Some believe that mean-centering fundamentally does not alleviate multicollinearity problems in multiple regression (Dalal & Zickar, 2012; Echambadi & Hess, 2007). Shieh (2011) suggests that depending on the nature of the data characteristics, mean-centering can alleviate a degree of multicollinearity. Following his diagnostic procedures, we compared the correlation coefficients of the regular predictors with the mean-centered predictors of the regression models and the variance inflation factors associated with each regression model. The correlation coefficients among leadership styles and knowledge acquisition are identical between the original data and the mean-centered data. However, the correlations between independent variables and the interaction terms are significantly reduced in the mean-centered data. In addition, the VIFs for the centered data are significantly lower than the original data regression models. Therefore, the mean-centering technique is appropriate in reducing multicollinearity problems in our study (Shieh, 2011). We followed Dawson (2014)'s advice to used mean-centered variables and reported the unstandardized regression coefficients and standard error in Table 2.

5.1. Dependent variable: product innovation

Table 2 presents the regression results of three models in which the dependent variable is product innovation. Model 1 includes only the control variables. Model 2 adds the main effect of TC leadership, transactional leadership, and the moderator into the regression. Model 3 adds all interaction terms. As Table 2 shows, the full model accounts for 48% of the variance in product innovation. In Model 2, adding the focal independent variables increases R-square by 0.26 ($p < .01$). The addition of the interaction terms in Model 3 also increases the R-square value significantly compared with Model 2 ($\Delta R^2 = .02$, $p < .01$), in support of the significant moderating effects of knowledge acquisition capability.

We hypothesize that both TC leadership and transactional leadership have positive effects on product innovation. In Table 2, Model 2, TC leadership has a significant positive effect on product innovation ($b = .44$, $p < .01$) in support of H1a. The effect of transactional leadership on product innovation is positive and marginally significant ($b = .10$, $p < .10$), lending weak support to H2a. We further hypothesize that the effect of TC leadership on product innovation is stronger than the effect of transactional leadership on product innovation. The t-test of equality of the two coefficients ($t = 4.25$, $p < .01$) indicates that the coefficient of TC leadership on product innovation is significantly greater than that of transactional leadership on product innovation, in support of H3a.

In hypothesis 4a, we propose that knowledge acquisition capability strengthens the role of TC leadership on product innovation. The results in Table 2, Model 3 show that the coefficient for the interaction term of TC leadership and knowledge acquisition capability is negative and statistically significant ($b = -.13$, $p < .01$), in opposition to our hypothesis and therefore we fail to support H4a. To fully examine the moderating effects, we decomposed the significant interaction terms and compared the impact of TC on product innovation at low and high levels of knowledge acquisition capability (Aiken & West, 1991). The low/high levels of the moderating variables are set as one standard deviation below/above their means (Aiken & West, 1991). We calculated the simple slopes and

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Table 2
Regression results for product innovation.

		Model 1		Model 2		Model 3	
		b	*t*-value	*b*	*t*-value	*b*	*t*-value
Control variables							
Firm age		−.03 (.08)	−.41	−.05 (.06)	−.84	−.06 (.06)	−1.08
Firm size		−.04 (.07)	−.56	−.03 (.06)	−.55	−.02 (.06)	−.28
Industry type		−.17 (.12)	−1.38	−.01 (.10)	−.11	−.07 (.10)	−.67
Technological turbulence		.45** (.05)	8.37	.16** (.05)	3.14	.16** (.05)	3.13
Direct effects							
TC leadership	H1a			.44** (.06)	7.27	.35** (.06)	5.46
Transactional leadership	H2a			.10# (.06)	1.51	.16* (.07)	2.45
Knowledge acquisition capability (KAC)				.14** (.05)	2.66	.15** (.05)	2.75
Moderating effects							
TC × KAC	H4a					−.13** (.04)	−3.10
Transactional × KAC	H5a					.11* (.06)	2.04
Adjusted R^2		.20		.46		.48	
ΔR^2				.26**		.02**	

Note: unstandardized coefficient with standard errors in brackets.
# $p < 0.1$.
* $p < .05$.
** $p < .01$ (two-tailed).

their significance levels associated with the lines in Fig. 2, according to Aiken and West (1991)'s suggested approach. The results in Fig. 2 show that knowledge acquisition capability reduces the positive effect of TC leadership on product innovation. Specifically, TC leadership has a smaller positive effect on product innovation when knowledge acquisition capability is high ($b = .25$, $p < .01$) than when it is low ($b = .46$, $p < .01$).

In hypothesis 5a, we propose that knowledge acquisition capability strengthens the positive relationship between transactional leadership and product innovation. The results show that the interaction between transactional leadership and knowledge acquisition capability on product innovation is positive and significant ($b = .11$, $p < .05$), and thus H5a is supported. Fig. 3 shows that transactional leadership has a significant positive effect on product innovation when knowledge acquisition capability is high ($b = .26$, $p < .01$) but a non-significant effect when knowledge acquisition capability is low ($b = .07$, n. s.).

5.2. Dependent variable: process innovation

Table 3 presents the regression results of three models with process innovation as the dependent variable. As Table 3 shows, the full model accounts for 48% of the variance for process innovation. In Model 5, adding the independent variables increases R-square by 0.25 ($p < .01$). The addition of the interaction terms in Model 6 also increases the R-square value significantly compared with Model 5 ($\Delta R^2 = .02$, $p < .01$), in support of significant moderating effects of knowledge acquisition capability.

We hypothesize that both TC leadership and transactional leadership have positive effects on process innovation. In Table 3, Model 5, TC leadership has a significant positive effect on process innovation ($b = .14$, $p < .01$), in support of H1b. The effect of transactional leadership on process innovation is also significant ($b = .32$, $p < .01$), in support of H2b. We propose the effect of transactional leadership on

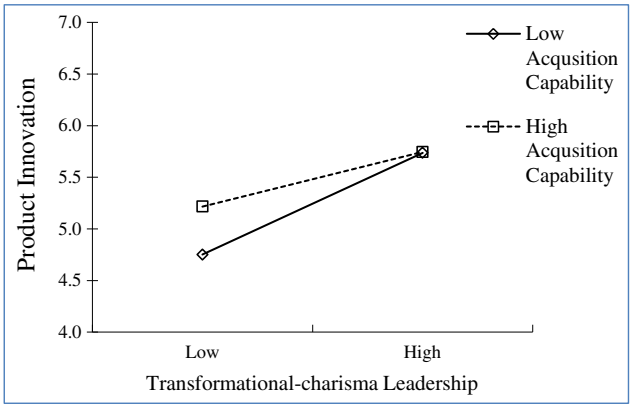

Fig. 2. Simple slope for the interaction effect of transformational-charismatic leadership and knowledge acquisition capability on product innovation.

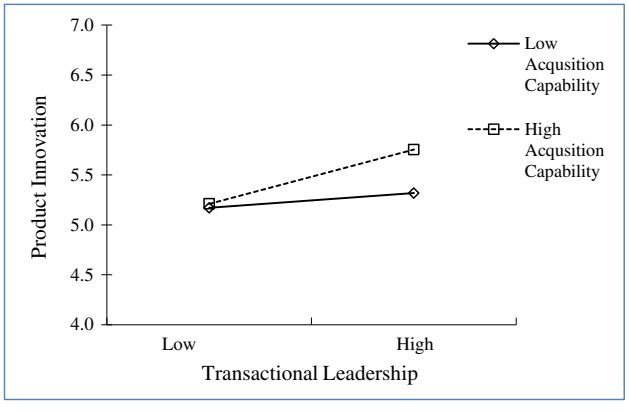

Fig. 3. Simple slope for the interaction effect of transactional leadership and knowledge acquisition capability on product innovation.

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Table 3
Regression results for process innovation.

		Model 4		Model 5		Model 6	
		b	*t*-value	*b*	*t*-value	*b*	*t*-value
Control variables							
Firm age		−.08 (.06)	−1.22	−.09# (.05)	−1.77	−.08# (.05)	−1.62
Firm size		.09 (.07)	1.36	.06 (.05)	1.19	.05 (.05)	.97
Industry type		−.38** (.11)	−3.53	−.20* (.09)	−2.21	−.15# (.09)	−1.65
Technological turbulence		.38** (.05)	7.89	.14** (.05)	3.05	.14** (.05)	3.17
Direct effects							
TC leadership	H1b			.14* (.05)	2.52	.20** (.06)	3.42
Transactional leadership	H2b			.32** (.06)	5.57	.27** (.06)	4.48
Knowledge acquisition capability (KAC)				.22** (.05)	4.50	.22** (.05)	4.53
Moderating effects							
TC × KAC	H4b					.10* (.04)	2.53
Transactional × KAC	H5b					−.11* (.05)	−2.24
R^2		.21		.46		.48	
ΔR^2				.25**		.02**	

Note: unstandardized coefficient with standard errors in brackets.
# $p < 0.1$.
* $p < .05$.
** $p < .01$ (two-tailed).

process innovation will be stronger than the effect of TC leadership on process innovation (H3b). The t-test of the equality of these two coefficients ($t = 2.305$, $p < .05$) indicates that the coefficient of transactional leadership on process innovation is significantly greater than that of TC leadership, in support of H3b.

H4b and H5b pertain to the moderating role of knowledge acquisition capability on the relationship between leadership and process innovation. The results in Table 3, Model 6 show that the coefficient for the interaction term of TC leadership and knowledge acquisition capability on process innovation is positive and statistically significant ($b = .10$, $p < .05$). Thus, H4b receives support. We decompose the interaction effect and show this in Fig. 4. Knowledge acquisition capability increases the positive effect of TC leadership on process innovation. Specifically, TC leadership has a greater positive effect on process innovation when knowledge acquisition capability is high ($b = .28$, $p < .01$) than when it is low ($b = .12$, $p < .01$).

The interaction effect between transactional leadership and knowledge acquisition capability is also significant ($b = -.11$, $p < .05$), in support of H5b. Fig. 5 shows that knowledge acquisition capability reduces the positive effect of transactional leadership on process innovation. Specifically, transactional leadership has a smaller positive effect on process innovation when knowledge acquisition capability is high ($b = .18$, $p < .05$) than when it is low ($b = .36$, $p < .01$).

5.3. The effects of controls

Control variables account for 20% of the variance of product innovation (see Table 2, Model 1) and 21% of the variance of process innovation (see Table 3, Model 4). In both models, the age and size of the firm do not have significant effect on either product or process innovation. Industry type has a negative significant influence on process innovation ($b = .38$, $p < .01$). This result indicates that high-tech firms have less process innovation than low-tech firms. Moreover, technological turbulence has a positive and significant effect on product innovation ($b = .45$, $p < .01$) and process innovation ($b = .38$, $p < .01$). This result suggests that a firm's product innovation and process innovation are highly influenced by technological turbulence on the market.

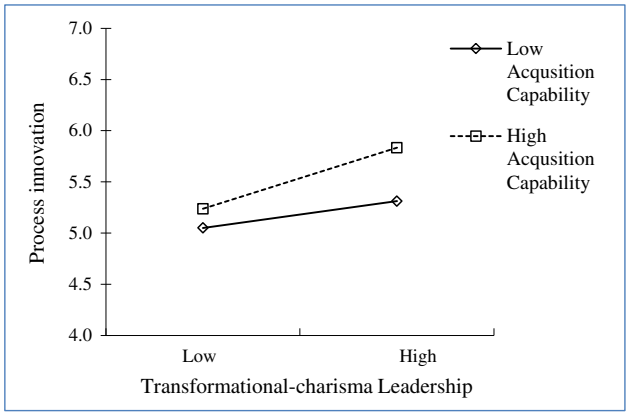

Fig. 4. Simple slope for the interaction effect of transformational-charismatic leadership and knowledge acquisition capability on process innovation.

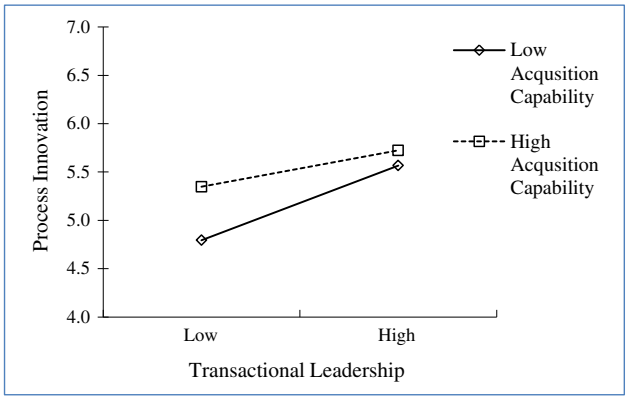

Fig. 5. Simple slope for the interaction effect of transactional leadership and knowledge acquisition capability on process innovation.

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6. Discussion

Leadership has been heralded as an important ingredient for organizational revitalization and has been identified as one of the most influential determinants of business innovation (Aragón-Correa et al., 2007; Jung et al., 2003). This study takes a comprehensive approach to examining two types of leadership (i.e., TC and transactional leadership) on two different kinds of innovation (i.e., product and process innovations). We found that TC leadership has a stronger effect on product innovation while transactional leadership has a stronger positive effect on process innovation. Furthermore, our research finds that the relationships between leadership and innovation are contingent on a firm's knowledge acquisition capability. Overall, we make several important theoretical contributions to leadership and innovation literature.

First, this study adds new insights into the innovation literature by sorting out the differences between product and process innovation and by providing a refined examination of the relationship between two types of leadership and two kinds of innovation. While a majority of studies focus only on product innovation and transformational leadership, our study examines the differing roles of two leadership types on both product and process innovation. Results show that both TC leadership and transactional leadership improve product and process innovations. However, TC leadership has a stronger positive effect on product innovation whereas transactional leadership has a stronger positive effect on process innovation. Transformational leadership promotes employees' intrinsic motivation and stimulates their creativity, which fosters product innovation. Transactional leadership focuses on the maintaining of existing production methods and supporting the refinement, improvement, and maximization of existing practices (Vera & Crossan, 2004), which facilitates process innovation.

Second, our finding of the impact of transactional leadership on innovation is particularly interesting. Some studies found a negative relationship between transactional leadership and follower creativity and performance (Jansen et al., 2009; Pieterse et al., 2010). We found that transactional leadership can actually facilitate both product and process innovation in China, with a much stronger positive effect on process innovation. A transactional manager may actually be preferable for manufacturing firms that focus on production improvement. This finding has important implications to firms in China which are now paying increasing attention to labor-saving and efficiency methods through process innovation.

Third, this study extends leadership literature by identifying factors that influence the effects of leadership on innovation. Knowledge acquisition capability strengthens the effect of TC leadership on process innovation such that the interactive effect of high TC leadership and high knowledge acquisition capability can best stimulate process innovation. The acquired external knowledge helps make TC leadership more effective with regard to process innovation. In addition, knowledge acquisition capability strengthens the effects of transactional leadership on product innovation. High knowledge acquisition capability can increase the effect of a detail-oriented leadership style on product innovation. The knowledge acquisition capability helps the firm and its employees gain external knowledge and eventually fulfill goals (e.g., new products) set by transactional leaders.

Fourth, we found that knowledge acquisition capability weakens the effect of transactional leadership on process innovation. Process innovation strives to achieve efficiency in fabricating products or utilizing new methods. When accompanied by too much new external information, the positive effect of transactional leadership may be reduced because both leaders and employees need more time to process the information and this reduces efficiency of overall outcomes.

To our surprise, knowledge acquisition capability attenuates the positive effects of TC leadership on product innovation. Fig. 2 shows that knowledge acquisition capability has no effect on innovation when TC leadership is high but helps with product innovation when TC leadership is low. TC leaders create organizational environments in which employees can try out new ideas without fear of punishment for failure (Jung, 2001) and also serve as role models for employees. TC leaders encourage innovation and new ways of approaching existing problems and issues, thereby stimulating employees to innovate. We reason that when TC leadership is high, the influence of the leader is very high on product innovation, and employees are motivated and work hard to innovate no matter what capability the firm has. However, when TC leadership is low, employees need external information to help them to perform their jobs because they cannot acquire such information from their leaders or from the organization. Therefore, the capability to acquire external information is crucial for employees to innovate.

7. Managerial implications

Our study sheds lights on the differing effects of TC leadership and transactional leadership on product and process innovation. In China, leadership is one of the most important factors that drive innovation and business strategies. During an interview, a CEO of a fingerprint lock company in China noted that if a leader does not show any interest in innovation, employees will not be motivated to make changes or to innovate. Leaders are not only role models for employees, but they also create an organizational environment that either encourages or suppresses innovation. Therefore, it is very important to understand the influence of different leadership styles on innovation, especially in China.

We found that TC leadership is particularly important for product innovation and transactional leadership is particularly important for process innovation. For example, Jack Ma, the founder of Alibaba group who is deemed as a typical TC leader, highly encourages his employees to innovate and come up with creative business solutions. His leadership style has spawned many revolutionary businesses in China, such as Alibaba, Taobao, Tmall, and Alipay (an online payment system). In addition, our study provides empirical evidence that transactional leadership can facilitate process innovation. China has many manufacturing companies that focus more on process innovation, such as introducing new production methods and new materials, as well as production design adjustments. These types of companies may need transactional leaders instead of TC leaders. Firms in China should take this into account during the strategic planning process, so that they identify which innovation outcome they are pursuing and then choose the appropriate leadership style.

Moreover, an organization's knowledge acquisition capability is an important factor that influences the relationship between leadership and innovation. According to Teece et al. (1997), dynamic capability can help a firm gain competitive advantage because it enables the firm to acquire new opportunities, assimilate and apply new knowledge (Teece et al., 1997). However, managers in China should bear in their mind that knowledge acquisition capability does not necessarily help firms innovate in all situations. In our study, knowledge acquisition ability attenuates the positive link between transactional leadership and process innovation and reduces the positive effect of transformational leadership on product innovation. Therefore, management should pay attention to the composite effects of different leadership styles and capabilities on product and process innovation.

8. Limitations and future research

There are several limitations to this study. First, it looks at the effects of two different kinds of leadership on product and process innovation. However, additional organizational and top-management (TMT) characteristics may contribute to different types of innovation. For example, upper echelon theory has identified that TMT's cognitive-based values, career experience, socio-economic roots, education, and group identities have significant influence on a firm's strategic choices,

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e.g., product innovation and diversification (Carpenter, Geletkanycz, & Sanders, 2004). Future research may include additional characteristics of TMT teams on the two types of innovation. Second, we only investigated product and process innovation and didn't include the other three types of innovation identified by Wang and Ahmed (2004), i.e., market, behavior, and strategic innovation. These three types of innovation represent an organization's overall innovative capability. Third, our study examines one component of dynamic capabilities: knowledge acquisition capability. A firm's dynamic capability includes acquisition capability, learning capability, as well as the capability to assimilate and to transform (Wang & Ahmed, 2007). Future research is encouraged to explore the direct, indirect, and interactive effects of knowledge acquisition capability, integration capability and coordination capability on the relationship between leadership and innovation. Fourth, our research involved data collection at one point in time; longitudinal data may indicate the effects of changes in leadership styles on innovation. Future research can address some of these gaps in the current body of knowledge.

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Appendix A

Construct and source	Description	Standard factor loadings
Transformation-charismatic leadership (Den Hartog et al., 2007) CR = .88; Cronbach's α = .88	• Our leader sets a good example	.73
	• Our leader has a clear vision on the future opportunities of the group	.78
	• Our leader demonstrates high levels of competence in work behaviors	.77
	• Our leader projects a convincing, powerful, and dynamic presence in his actions at work	.78
	• Our leader provides a good role-model for me to follow (1 = not at all, 7 = very much so)	.79
Transactional leadership (Den Hartog et al., 2007) CR = .79; Cronbach's α = .76	• Our leader points out what I will receive if I do what is required	.73
	• Our leader tells me what to do to be rewarded for my efforts	.68
	• Our leader is alert for failure to meet standards	.75
	• Our leader works out agreements with me on what I will receive if I do what needs to be done (1 = not at all, 7 = very much so)	.63
Product innovation (Paladino, 2008) CR = .88; Cronbach's α = .87	• The quality of this new product is superior to that of our competitors.	.81
	• This product design (in terms of functionality and features) is superior to that of our competitors.	.76
	• Overall, we have an advantage over our competitors in terms of this new product we offer our customers.	.76
	• This new product is minor improvements in a current technology.	.68
	• This new product incorporates a large new body of technological knowledge.	.69
	• The applications of this new product are totally different from the applications of our main competitors' products.	.73
Process innovation (Wang & Ahmed, 2004) CR = .80; Cronbach's α = .79	• We are constantly improving our business processes	.68
	• Our company changes production methods at a great speed in comparison with our competitors.	.65
	• During the past five years, our company has developed many new management approaches.	.71
	• When we cannot solve a problem using conventional methods, we improvise on new methods.	.79
Knowledge acquisition capability (Jansen et al., 2005) CR = .74; Cronbach's α = .73	• Our firm regularly visits suppliers and customers to acquire new knowledge	.67
	• We collect industry information through informal means (e.g. lunch with industry friends, talks with trade partners)	.57
	• Our firm periodically organizes special meetings with customers or third parties to acquire new knowledge.	.72
	• Our employees regularly approach third parties such as accountants, consultants, or tax consultants.	.62
Technological turbulence (Jaworski & Kohli, 1993) CR = .79; Cronbach's α = .79	• The technology in our industry is changing rapidly.	.75
	• Technological changes provide big opportunities in our industry.	.75
	• A large number of new product ideas have been made possible through technological breakthroughs in our industry.	.70
	• Technological developments in our industry are rather minor.	.60

Note: all items, except as transformational and transactional leadership indicated, use Likert scales (1 = "strongly disagree"; 7 = "strongly agree"). CR = composite reliability.

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