

Discipline versus passion: Collectivism, centralization, and ambidextrous innovation

Zhi Yang · Xuemin Zhou · Pengcheng Zhang

Published online: 23 October 2014

© Springer Science+Business Media New York 2014

Abstract Can the collectivistic culture of an organization help manage the tension between explorative and exploitative innovation? Though recent studies have suggested contextual approaches to cope with the tension, we still lack an understanding regarding whether organizational culture can be a context vehicle in solving the tension and consequently in enabling ambidextrous innovation. Drawing upon organizational effectiveness theory, we seek to present a collectivistic culture perspective in achieving ambidexterity and aim to settle the nested paradox of innovation in the pair of personal drivers, that is, discipline versus passion. Based on 102 completed survey questionnaires from 60 high-tech clusters in China, we found that creating collectivistic culture within an organization can help alleviate the tension between exploration and exploitation in organizational learning and facilitate ambidextrous innovation within the firm. Moreover, the effect of collectivism on achieving ambidextrous innovation will be weakened in a centralized hierarchy system.

Keywords Exploration · Exploitation · Ambidexterity · Organizational learning · Collectivism

Can collectivism alleviate the tension between explorative and exploitative innovation to achieve ambidextrous innovation? Though both exploration and exploitation are essential to organization success, and ambidextrous innovation is supposed to be associated with long-term high performance (He & Wong, 2004; Jansen, Simsek, & Cao, 2012; Zhan & Chen, 2013; Zhou & Li, 2007), achieving such ambidexterity is challenging, and the question of how to achieve ambidexterity has become a central issue in innovation management literature (Fang, Lee, & Schilling, 2010; Gibson & Birkinshaw, 2004;

Z. Yang · X. Zhou (✉) · P. Zhang
School of Management, Huazhong University of Science and Technology, Wuhan 430074, China
e-mail: xueminzhou@hust.edu.cn

Z. Yang
e-mail: zhiyang@hust.edu.cn

P. Zhang
e-mail: zhangpch@hust.edu.cn

Lavie & Rosenkopf, 2006; Siggelkow & Levinthal, 2003; Tushman & O'Reilly, 1996). Recent studies have identified two major approaches through either isolated organizational structure design (Fang et al., 2010) or compatible organizational context (Gibson & Birkinshaw, 2004). Contextual ambidexterity is regarded as a higher-order approach and may generate lasting benefits in achieving organizational effectiveness (Birkinshaw & Gibson, 2004). However, questions regarding what specific context is essential to dealing with the tension and how the interaction between organizational context and structure affects ambidexterity still remain unclear.

Contextual ambidexterity finds its root in organizational effectiveness theory, which suggests that organizational culture as a context of an organization can allow the *meta-capabilities* to help manage the paradoxical nature of effectiveness (Cameron, 1986; Denison & Mishra, 1995; Ghoshal & Bartlett, 1994; Gibson & Birkinshaw, 2004). According to Denison (1990: 2), the implicit culture of an organization is “the underlying values, beliefs, and principles that serve as a foundation for an organization’s management system as well as the set of management practices and behaviors that exemplify and reinforce those basic principles.” Such invisible sets of values, beliefs and principles can shape individual and collective behaviors toward ambidexterity by encouraging individuals to shift their attention, time and resources between alignment and adaptability spontaneously (Gibson & Birkinshaw, 2004).

Members within certain organizational cultures may reconcile the tension between discipline and passion, the former of which stresses conformity to organizational goals while the latter signifies the personal zeal of engaging in unique, challenging, and radical innovations (Andriopoulos & Lewis, 2009). Collectivism can induce higher level of organizational citizenship behaviors (OCB) and lower level of social loafing effect (Comer, 1995; Earley, 1989; Organ, 1990; Podsakoff, MacKenzie, Paine, & Bachrach, 2000), which can change the extent of tension stemming from paradoxical personal drivers. While social loafing represents the employees’ propensity of withholding efforts, OCB focuses on the propensity of providing extra efforts (Kidwell & Bennett, 1993). On the one hand, collectivism, by shaping OCB (Moorman & Blakely, 1995; Wang, Hinrichs, Prieto, & Howell, 2013), is likely to create passion for uniqueness by providing extra support and initiatives to facilitate the recombination of ideas to generate novelty (Bartel & Garud, 2009). On the other hand, it will provide individual members with positive group identity (Chen, Chen, & Meindl, 1998; House, Hanges, Javidan, Dorfman, & Gupta, 2004; Triandis, 1995) and take the organizational benefits and costs into consideration with discipline. Furthermore, collectivism, by easing the social loafing effect which induces more discipline driver (Comer, 1995; Earley, 1989; Karau & Williams, 1993), is likely to compensate the motivation loss and fuel passion driver of organizational members, and consequently induce more balance between discipline and passion drivers. Therefore, collectivism may be an effective mechanism to overcome the tension between discipline and passion in personal drivers, thus facilitating ambidextrous innovation within firms (Andriopoulos & Lewis, 2009).

However, is collectivism always effective? While collectivism may balance the tension between discipline and passion by promoting OCB and easing social loafing, it may be largely affected by organizational structure (Fiol & Lyles, 1985; Garicano & Wu, 2012). Prior research has suggested that decentralized structure is helpful in motivating exploration, whereas centralization is necessary for exploitation and commercialization

(Duncan, 1976; Siggelkow & Levinthal, 2003). We argue that it is interesting and insightful to explore the moderating effect of organizational structure on the relationship between collectivistic culture and ambidextrous innovation. We thus examine two interrelated research questions in this study: Does a collectivistic culture improve the balance between exploration and exploitation and help achieve ambidextrous innovation? And, if this collectivistic culture is beneficial, are its benefits dependent on other organizational characteristics, such as the centralized decision-making structure?

By answering these questions, we try to contribute to the ambidexterity literature in three major ways. First, we try to extend the contextual ambidexterity literature (Gibson & Birkinshaw, 2004) by looking at collectivistic culture to solve the tension between explorative and exploitative innovation. A collectivistic culture is supposed to establish a type of organizational context that encompasses both discipline and passion, with stretch, trust, and support. As Gibson and Birkinshaw (2004) suggested, such an organizational context can facilitate organizational members to balance their attention and resources between conflicting activities, thus promoting ambidexterity.

Second, we try to examine the moderating effect of organizational structure on the relationship between collectivistic culture and ambidextrous innovation. By reducing the participation of general members in decision-making, centralization is likely to decrease the level of OCB but exaggerate social loafing effect. Thus, centralization may weaken the alleviation effects of collectivism on the tension between discipline and passion, and then negatively moderate the effect of collectivism on ambidextrous innovation.

Third, we extend the discussion of organizational tension in ambidextrous innovation and organizational learning. Though the tension between exploration and exploitation has been acknowledged in the literature (Fang et al., 2010; Gibson & Birkinshaw, 2004; He & Wong, 2004; March, 1991), there have been very few studies that further our understanding of how tension arises in ambidextrous innovation, and what can be an appropriate scheme for dealing with the specific tension of ambidexterity (Andriopoulos & Lewis, 2009). In this respect, we attempt to elucidate the specific paradoxes in ambidextrous innovation.

Conceptual background

Ambidextrous innovation: Exploration versus exploitation

Ambidexterity, in a broad sense, means the ability to simultaneously take different and conflicting activities in an organization (Gibson & Birkinshaw, 2004; Rothaermel & Alexandre, 2009). *Ambidextrous innovation* refers to the ability of a firm to pursue explorative and exploitative innovation simultaneously (Duncan, 1976; He & Wong, 2004; Tushman & O'Reilly, 1996). *Exploration* and *exploitation* are the two fundamental but different approaches of organizational learning, and the former purports to search for new possibilities and opportunities, while the latter involves more improvement and development of existing resources and capabilities (March, 1991; Su, Li, Yang, & Li, 2011). Both of them are essential for organizations, but they compete for attention and resources (He & Wong, 2004; March, 1991).

Balance between exploration and exploitation enables a firm's survival, prosperity, and long-term performance, and fosters its dynamic absorptive capacity (He & Wong, 2004; Jansen et al., 2012; Levinthal & March, 1993; Tushman & O'Reilly, 1996; Zhan & Chen, 2013). Solely chasing either exploration or exploitation will lead the organization to be trapped in a suboptimal equilibrium (He & Wong, 2004). While exploitation yields more certain and immediate returns, and leads to more stable and continuous performance (Fang et al., 2010; He & Wong, 2004; Levinthal & March, 1993), it is likely to inhibit the discovery of novel solutions and vital opportunities, and finally lead to *competency trap* that presents more organizational inertia, and even obsolescence in the long run (Cohen & Levinthal, 1990; Fang et al., 2010; Levinthal & March, 1993).

On the other hand, when exploration brings more variable and distant-in-time returns (He & Wong, 2004), enables the discovery of new and profoundly novel solutions, and shapes the organization's adaptability to the external environment, searching processes usually fail (Levinthal & March, 1993). Such a failure may interrupt the normal routines of organizations, and the self-reinforcing effect may lead the firm to *failure trap* (Cohen & Levinthal, 1990; Fang et al., 2010; He & Wong, 2004). Therefore, beyond all doubt, successful organizations should be ambidextrous. Firms must use both hands with equal ease: one hand is used to ensure exploration to adapt to external changes and enter new product and market domains; while the other hand is capable of guaranteeing exploitation to take full advantage of existing assets and experience to create value (Andriopoulos & Lewis, 2009; Zhan & Chen, 2013).

However, achieving exploration and exploitation simultaneously may raise challenging tensions. Following March's (1991) seminal paper on the trade-off between exploration and exploitation, studies have shown that exploration and exploitation may require different strategies, structures, and cultures (Duncan, 1976; He & Wong, 2004; Smith & Tushman, 2005). Yet, related research is limited, and we still do not understand much about what the tensions are. Specifically, Andriopoulos and Lewis (2009) presented three highly robust paradoxes between the two types of innovation, which suggests that tensions may rise from strategic intent, customer orientation, and personal drivers: when exploitation emphasizes profit, a tight-coupling customer, and discipline, exploration puts emphasis on breakthrough technology, loose-coupling clients, and passion.

Despite the difficulties, scholars still endeavor to manage the exploration-exploitation tension. Typical solutions have been proposed from two ways, one is structure-based solutions (Benner & Tushman, 2003; Fang et al., 2010; Lavie & Rosenkopf, 2006; Siggelkow & Levinthal, 2003), and the other is context-based solutions (Gibson & Birkinshaw, 2004). Structure-based solutions embody three approaches. First, a firm can externalize either exploitative or explorative activities through outsourcing or alliance formation (Holmqvist, 2004; Lavie & Rosenkopf, 2006). However, organizations may have to pay higher costs in managing the outsourcing or alliance. Second, organizations may temporally achieve ambidextrous innovation. Firms may use decentralization to motivate exploration and then resort to centralization to execute the exploitation, thus yielding long-term high performance through the temporal arrangement (Duncan, 1976; Siggelkow & Levinthal, 2003). Third, creating some semi-isolated subgroups within a firm that have a small fraction of cross-group links seems to be a novel and possible solution (Fang et al., 2010). In

this approach, new product development (NPD) teams may be isolated from the mainstream organization and help handle the tension between exploration and exploitation internally at the same time (Benner & Tushman, 2003).

By contrast, the context-based solution means that by constructing a set of supportive systems and processes organizations can encourage individuals to make their own judgments and allocate their time, attention, and resources to balance various conflicting activities (Gibson & Birkinshaw, 2004). The tension that results from simultaneous incompatibilities is the springboard from the paradoxical ideas, which have two faces looking in opposite directions. However, managing such tension is a prerequisite for effective organizations (Cameron, 1986). Gibson and Birkinshaw (2004) suggested that an organizational context with a combination of stretch, discipline, support, and trust can facilitate contextual ambidexterity and business-unit performance. Though they have illustrated the characteristics of the ambidextrous organizational context, the question of what type of firms can create such a context remains unclear. Can organizational culture contribute to the context and help alleviate the tension between exploration and exploitation? Specifically, a culture with a collectivism orientation may be a particular context that helps to promote ambidexterity inside an organization (Drazin & Schoonhoven, 1996; Morris, Davis, & Allen, 1994; Tellis, Prabhu, & Chandy, 2009; Tushman & O'Reilly, 1996).

Collectivism and innovation

Collectivism, in contrast to individualism, refers to the degree that individuals care about group goals and base their identities on group memberships (Hofstede, 1984; House et al., 2004; Wagner & Moch, 1986). Collectivism indicates an orientation whereby individual members show a subordination of personal interests to group welfare; it emphasizes sharing, cooperation and group harmony (Chen et al., 1998; Triandis, 1995). Individualism/Collectivism (I-C), was initially put forward as a key dimension of national culture (Hofstede, 1984) and has been deeply rooted in cross-cultural research (Hui & Triandis, 1986; Shane, Venkataraman, & MacMillan, 1995). Later, it received more attention from organizational researchers and was extensively studied at the organizational level (Chen et al., 1998; Earley & Gibson, 1998; House et al., 2004; Robert & Wasti, 2002).

Prior studies suggest several effects of collectivism on members of an organization. First, members in collectivistic culture always exhibit their group identities. They engage in less *social loafing* in which individuals in a group are less motivated and make less effort than if they were to work alone (Comer, 1995; Earley, 1989; Karau & Williams, 1993). Because they are driven by social norms and obligations, rather than their own beliefs or values (Chen et al., 1998; Triandis, 1995), collectivists emphasize the attainment of group outcomes regardless of the identifiability of their personal inputs. Second, members in collectivistic culture show remarkably lower opportunistic propensity toward intragroup transactions (Chen, Peng, & Saporito, 2002; Doney, Cannon, & Mullen, 1998) and are likely to perform OCB, whereby organizational members go above and beyond the requirements of their job descriptions (Moorman & Blakely, 1995; Wang et al., 2013). On the one hand, a high level of OCB within an organization facilitates altruism and organizational compliance; on the other hand, it also encourages sportsmanship and individual initiatives beyond basic requirements

(Organ, 1990; Smith, Organ, & Near, 1983). Thus, more OCB can help enhance managerial productivity, free up resources to initiate more ambitious attempts, coordinate activities both within and across organizational units, make the organization more adaptable to changing markets, and thus contribute to organizational success (Podsakoff et al., 2000; Van Dyne, Vandewalle, Kostova, Latham, & Cummings, 2000).

At the individual or group level, the relationship between collectivism and creativity has been extensively discussed. Some research suggests that individualism and creativity are positively related (Goncalo & Staw, 2006; Rank, Pace, & Frese, 2004) because individualistic culture emphasizes independence, uniqueness, autonomy, and achievement (Triandis & Suh, 2002), thus reducing conformity pressures and contributing to the generation of novel ideas (Goncalo & Staw, 2006). However, other research indicates that collectivism can also benefit creativity (Bechtoldt, De Dreu, Nijstad, & Choi, 2010; Erez & Nouri, 2010; Wang, Xue, & Su, 2010). Erez and Nouri (2010) showed that while individualism encourages idea novelty and originality, collectivism stresses usefulness and appropriateness. Yao, Wang, Dang, and Wang (2012) argued that horizontal collectivism positively influences idea generation, while vertical collectivism has a positive impact on idea implementation. Furthermore, members under high pro-social motivation (rather than pro-self-motivation) will produce more ideas (Bechtoldt et al., 2010); employees' creativity is positively related with work support from both supervisors and coworkers (Wang et al., 2010). These verdicts illustrate that collectivism may be positively associated with innovation and organizational performance.

As an important context, organizational culture can play a critical role in innovation (Bartel & Garud, 2009; Drazin & Schoonhoven, 1996; Tellis et al., 2009). In particular, some studies have found that organizational culture can be one of the key sources of ambidexterity by fostering a supportive organizational context and optimizing organizational learning processes (Bhatt, 2000; O'Reilly & Tushman, 2004; Tushman & O'Reilly, 1996). Morris et al. (1994) indicated that examining whether a collectivistic orientation is related to the nature and types of innovation (e.g., discontinuous vs. incremental) can provide insights. Goncalo and Staw (2006) suggested that collectivism is more beneficial to exploitation than exploration, but empirical evidence is still lacking. Mueller, Rosenbusch, and Bausch (2013) hypothesized a negative relationship between collectivism and explorative innovation but found a positive one in their meta-analysis. They concluded that collectivistic culture can alleviate the resistance from employees and middle managers in high-risk explorative activities by promoting teamwork and good relationships between organizational members. In summary, scholars hold mixed positions concerning the relationship between collectivistic culture and innovation, and it is imperative to examine the relationship between collectivism and ambidextrous innovation.

Hypotheses

Collectivism as a solution to balance exploration and exploitation

As we discussed above, exploration and exploitation are the two fundamental forms of organizational learning (Kim, Park, & Lee, 2014; March, 1991; Su et al., 2011).

Achieving exploration and exploitation enables success but yields challenging tensions. Collectivism can alleviate the tensions between exploration and exploitation that are embedded in all the sub-processes of organizational learning, namely knowledge creation, retention and transfer (Argote & Miron-Spektor, 2011), through balancing the discipline and passion of organizational members' personal drivers (Kane, Argote, & Levine, 2005; Levin & Cross, 2004; Wong & Tjosvold, 2006).

In the *knowledge creation process*, organizational members create new knowledge by accomplishing organizational tasks (Argote & Miron-Spektor, 2011). The discipline driver of organizational members serves to align individual behavior with existing well-defined processes and standardized practices, and emphasizes the sacrifice of personal interest for the sake of group benefits (Andriopoulos & Lewis, 2009). Driven by discipline, individual members in a firm are likely to set clear goals and tasks that are in line with organizational routines, and constrain their randomly generated research interests which may potentially undermine organizational strength. In achieving those clearly defined tasks and goals, individual members driven by discipline are more likely to reuse and recombine existing knowledge to enhance existing strengths of the organization, which collectively lead to exploitative innovation (Bhatt, 2000). In contrast, the passion driver in organizational members pursues for unique, different ideas with the desire for intellectual challenge and unexpected inspiration regardless of whether it aligns with organizational goals (Andriopoulos & Lewis, 2009). Driven by passion, individual members in a firm are more likely to generate new ideas based on their personal experience and knowledge rather than organizational knowledge. They are also more likely to create new and radical knowledge that is completely different from the existing knowledge and practice the firm accumulated in past experience (Andriopoulos & Lewis, 2009). It may potentially break up the technological strengths the firm has established in the existing market (Bhatt, 2000). Pursuing either one at the cost of the other will lead the firm to a competency trap or failure trap (Cohen & Levinthal, 1990; Fang et al., 2010; He & Wong, 2004).

Collectivistic culture can alleviate the tension between discipline and passion in personal drivers in knowledge creation for two reasons. First, collectivistic members will have a higher level of OCB, which enhances positive group identity and strong initiatives for the long-term benefit of the organization (Moorman & Blakely, 1995; Podsakoff et al., 2000; Van Dyne et al., 2000; Wang et al., 2013). As OCB involves group alignment as a helping behavior, organizational loyalty, and compliance, it also encourages sportsmanship, individual initiatives, and self-development that go well beyond minimally required levels of internal maintenance (Organ, 1990). On the one hand, members with OCB will accept, internalize, and follow the organization's routines, rules, and standardized procedures in the process of accomplishing organizational tasks (Podsakoff et al., 2000). They will protect the organization and take its benefits into consideration with discipline. On the other hand, employees with higher level of OCB will volunteer more creativity and innovation, keep enthusiasm and effort to working tasks, and bear the frustration or inconveniences in proposing disruptive solutions to adapt the organization to environmental changes more effectively (Podsakoff et al., 2000). Members with OCB have the discretion to influence the organization to fulfill their individual vision while they serve the organization, since their unified personal identity conforms to organizational identity (Caldwell, 2011; Graham & Van Dyne, 2006). Therefore, members in a collectivistic culture will engage

in more OCB and then passionately generate new ideas that encourage radical thoughts and disruptive solutions to the working tasks. Members in a collectivistic culture will not blindly reject unique ideas that may undermine organizational strength or blindly follow entrenched routines to refine existing knowledge, but they may evaluate and make their own judgments about the benefits and costs of their new ideas to the organization (Gibson & Birkinshaw, 2004). Accordingly they may allocate their time, attention and resources to a different knowledge base, and determine what proportion of the different knowledge is optimal to create for the organization's ambidexterity.

Second, collectivistic culture will help ease the social loafing effect in which individual effort in a group is less than that when the individual works alone (Comer, 1995; Earley, 1989; Karau & Williams, 1993). When working in groups, individual members may lose their motivation because of unidentifiable inputs (Comer, 1995; Kerr & Bruun, 1983), misappropriate evaluation and self-attention (Mullen, 1983), mismatching efforts (Harkins, 1987), and so on. This social loafing effect will induce more discipline driver rather than passion driver for individuals working in organizations. Members will act only on their accountabilities to avoid punishments from the organization and will withhold efforts in creative expression and personal challenge (Kidwell & Bennett, 1993), resulting in excessive standardization and rigidity (Andriopoulos & Lewis, 2009). They will not take initiatives to create radical ideas and contribute to new knowledge generation. However, in a collectivistic culture, when social loafing has been eased (Comer, 1995; Earley, 1989), the intrinsic motivation loss will be compensated and the passion driver can be fueled (Andriopoulos & Lewis, 2009). Then members will not only follow the organizational routines with discipline to exploit existing knowledge but also take initiatives to create radical ideas and contribute to knowledge generation in explorative learning. Thus, by easing social loafing, collectivism can achieve more balance between discipline and passion in knowledge creation.

Knowledge retention refers to what the organization commits to memorize and forget (Argote & Miron-Spektor, 2011). The discipline-passion tension embedded in the knowledge retention process may also manifest itself in several aspects. The discipline driver of individuals may cause organizational members to retain knowledge in line with existing organizational knowledge, and forget different or disruptive knowledge at an accelerating rate. By contrast, passion-driven individuals may choose to memorize unique experience or knowledge and forget the routine knowledge at an accelerating rate (Andriopoulos & Lewis, 2009). Following a similar logic in the knowledge creation process, collectivism can help alleviate the tension between discipline and passion drivers in knowledge retention process. Collectivistic culture, by inducing OCB, will motivate members to memorize knowledge that is beneficial to the organization, rather than memorize knowledge solely based on their familiar experience or routines. The task-task network or the member-task network within the organization will be more flexible in organizations with a collectivistic culture (Argote & Ingram, 2000). Moreover, less social loafing in the collectivistic culture also facilitates members in making more effort to balance the tension between discipline and passion in the knowledge retention process. By taking more initiatives in memorizing different knowledge, members in organizations may retain and forget a more appropriate portion of new knowledge, which alleviates the conflicts in the knowledge retention process.

Knowledge transfer refers to the learning process that members or groups learn directly or indirectly from the experience of others (Argote & Ingram, 2000; Szulanski, 2000). The discipline-passion tension embedded in the knowledge transfer process may manifest itself in the following aspects. The discipline driver may cause members or groups to choose similar experiences or knowledge to adapt or absorb (Darr & Kurtzberg, 2000), or learn the other's experience heavily based on their own expertise (Cross & Sproull, 2004). In contrast, passion-driven members may learn others' experience, knowledge, and expertise at a distance (Cross & Sproull, 2004; Darr & Kurtzberg, 2000). Similar to the arguments in the knowledge creation process, collectivism can also alleviate the tension in knowledge transfer process. Collectivistic culture induces a higher level of OCB and a lower level of social loafing. Organizational members will make more efforts to balance the discipline and passion drivers in what they are going to learn, and how to learn. They will not choose their learning target based solely on the similarity of experience or expertise. Instead, members will choose their learning target based on the criteria of whether the learning outcome is beneficial to the organization, achieving the balance between exploration and exploitation in the knowledge transfer process.

Overall, collectivism can facilitate organizational members in felicitously allocating their attention, time and resources between the conflicting forms of organizational learning, overcome the tensions (especially in personal drivers, i.e., discipline versus passion) between exploitation and exploration, and as a result, realize ambidextrous innovation *within the organization*. Therefore, we propose our first hypothesis:

Hypothesis 1 Collectivism of an organization is positively associated with its ambidextrous innovation.

The moderating effect of centralization

Centralization of decision-making refers to the extent to which the locus of decision-making authority is confined to the higher levels of the hierarchy within a firm (Cardinal, 2001; Child, 1972; Jansen, Van den Bosch, & Volberda, 2006). Although centralization seems to promote consensus-making and unified deployment (Wally & Baum, 1994), it restricts employees' participation and generates work dissatisfaction (Pierce & Delbecq, 1977) and alienation from both their job and fellow workers (Aiken & Hage, 1966). Thus, centralization is likely to decrease employees' OCB. Furthermore, in a centralized hierarchy system, rank-and-file members will not have necessary autonomy and will only passively comply with their higher level supervisors (Child, 1972), rely on top management, and not want to bear responsibility (Cardinal, 2001; Jansen et al., 2006). Eventually, centralization leads to excessive bureaucracy (Nickerson & Zenger, 2002) and results in a severe social loafing effect. Hence, by decreasing the level of OCB but exaggerating social loafing effect, a centralized decision-making structure negatively moderates the relationship between collectivism and ambidexterity in the three stages of organizational learning for the reasons outlined below.

In the knowledge creation process, the positive effect of collectivism on the balance between explorative and exploitative knowledge creation will be dramatically hampered by centralization. First, in a centralized organization, members will show lower OCB. They become anxious about their own status, gains and losses, rather than concerning

about the collective benefits and costs of the organization (Bunderson & Reagans, 2011). They are less motivated by passion or even discipline, but become afraid of creating breakthrough knowledge and even hesitate to make any progress on existing knowledge. Furthermore, by exaggerating inadvisable social loafing that has been reduced by collectivism, centralization will also diminish members' efforts to balance discipline and passion (Karau & Williams, 1993); members may not create knowledge that is beneficial to themselves, nor generate new knowledge for the sake of organizational benefits. Thus, centralization interrupts the balance between discipline and passion that members in collectivistic culture should display, and hampers the positive effects of collectivism on the balance between explorative and exploitative knowledge creation.

In the knowledge retention process, in a centralized organization where OCB is decreased and social loafing is exaggerated, members will not take the initiative to remember different knowledge that is beneficial to the organization (Karau & Williams, 1993; Podsakoff et al., 2000). They memorize or forget knowledge according to their own experience, preference, and expected returns, which makes the member-task network and task-task network more rigid (Argote & Ingram, 2000). The balance of discipline and passion is therefore lost in knowledge retention. As a result, the positive effects of collectivism on both explorative and exploitative knowledge retention will also be hampered by a centralized hierarchy system.

In the knowledge transfer process, because centralization decreases the level of OCB within the firm, and constrains the channels of knowledge transfer (Cardinal, 2001; Jansen et al., 2006), members will adapt their learning behavior to biased approaches so that they learn others' experience from constrained channels or conform to the management requests. They lose the balance between discipline and passion drivers because they lack the autonomy to choose between explorative knowledge and exploitative knowledge to transfer. In addition, the social loafing effect exaggerated by centralization will undermine individuals' motivation to learn unique and radical knowledge that may be beneficial to the organization (Organ, 1990). Furthermore, without sufficient group identity and motivation, recipients in the transfer process may suppress their potential absorptive capacity and even exert feigned acceptance (Szulanski, 2000). Therefore, centralization will reduce collectivistic members' efforts in transferring explorative knowledge, as well as in transferring exploitative knowledge.

In conclusion, centralization is likely to weaken the alleviation effects of collectivism on the tension (discipline versus passion) between explorative and exploitative organizational learning. Hence, we posit the second hypothesis:

Hypothesis 2 The adoption of a centralized decision-making structure negatively moderates the effect of collectivism on the level of ambidextrous innovation.

Methodology

Sampling and data collection

To examine the effects of collectivism on ambidextrous innovation, we conducted a survey in China in 2010. China is widely believed to be a country of high collectivistic

culture, differing significantly from the United States, an individualistic country (Kwon, 2012; Li & Peng, 2008). In 2010, we surveyed firms from 60 high-growing industrial clusters in the Hubei Province, one of the largest geographic technology clusters in China. Firms within these clusters renew their high-tech company status with the provincial government annually. Therefore, they invest substantially in R&D activities and are highly innovation-oriented firms which serve as a proper population for this study.

The questionnaire was developed during March to July 2010. On the basis of previous studies (Brislin, 1986), we first developed an English-language version of the questionnaire, translated it into Chinese, and then commissioned a back-translation by two independent translators. We then revised several questionnaire items to enhance clarity. In September 2010, we cooperated with the provincial government authority to administer the questionnaire to the 60 industrial clusters. We distributed questionnaires to local authorities first, instructing them to choose five firms randomly in each local cluster. To reduce the bias corresponding to the respondents' concern over government investigation, we instructed respondents that the questionnaires will be returned to the research team directly by mail. In addition, they are not required to provide their firms' name and registration identity number. After a one-time reminder, a total of 162 firms responded to the survey, a response rate of 54 %.

To reduce the potential common method bias (Podsakoff, MacKenzie, Lee, & Podsakoff, 2003), we split the questionnaire into two separate parts and invited two top managers to complete the survey independently. One part contains questions concerning organizational culture, organizational structure, and so on, and the other part contains questions on innovation performance, industrial environment, and organizational demography. We also checked possible nonresponse bias in our sample by comparing the differences between early and late respondents in their ratings of key variables used in this study (Datta, Guthrie, & Wright, 2005). The *t*-test results were all insignificant ($p > .1$), showing that there is no significant difference between the early and late responses. Moreover, we performed χ^2 tests, comparing our sample and the population in organizational characteristics, such as number of employees ($\chi^2 = 1.383$, $df = 1$, $p = .242$) and year of firm foundation ($\chi^2 = 2.237$, $df = 1$, $p = .138$) and found no significant differences.

However, because of missing values, only 103 questionnaires were usable for statistical analysis. In addition, some outliers in the part of *explorative innovation* and *exploitative innovation* were found. For instance, the coding 6 is out of the regime of five-point Likert scales. Therefore, the final sample size is 102. The 102 firms under study have an average of 740 employees and 11 years of operation.

Table 1 shows the distribution of our sample firms in industries, ownership, firm size, and firm age. There are 24 firms (23.53 %) in technology-intensive industries, such as pharmaceuticals, computing machinery, medical, precision and optical instruments; 30 firms (29.41 %) in labor-intensive industries, including food products, beverages, textile, leather and footwear, printing and paper products as OECD catalogue suggested (Criscuolo & Martin, 2004); and 38 firms (37.25 %) in other industries. Regarding firm ownership, 5 firms (4.9 %) are state-owned enterprises, 76 (74.51 %) are privately-owned enterprises, 7 firms (6.86 %) are foreign-owned enterprises, and 14 firms (13.73 %) are of mixed ownership. Firm size in our sample ranges from small to very large firms as Table 1 suggests. Age of the sampling firms ranges from new ventures to

established firms, of which 17 firms (16.67 %) have less than 5 years' operation, 43 firms (42.16 %) have ages between 5 and 9 years, 34 firms (33.33 %) are 10 to 19 years old, and 8 firms (7.84 %) have been operating for more than 20 years. Such a profile suggests that our sample has sufficient variations in those firm attributes.

Measurements

In the Appendix (Table 5), we report the constructs measurement and their reliability and validity tests. We measured collectivism and technological capability by groups of 7-point Likert scale questions, while other constructs were measured by 5-point scale questions, from strongly disagree to strongly agree.

Exploration, exploitation, and ambidexterity Following He and Wong (2004: 485), we operationalized exploration and exploitation “as two distinct dimensions of learning behavior, rather than as two ends of a unidimensional scale.” The eight Likert-scale items were adopted to measure how firms divide attention and resources between explorative innovation (e.g., introducing a new generation of products, entering new product-market domains) and exploitative innovation (e.g., improving existing product-market efficiency, reducing production costs) in the last two years. The interaction term of

Table 1 Profiles of the sample companies ($N = 102$)

Sample characteristics	Frequency	%
Industry		
Pharmaceuticals, computing machinery, medical, precision and optical instruments, etc.	24	23.53
Food products, beverages, textile products, leather and footwear, printing and paper products, etc.	30	29.41
Motor vehicles, machinery and equipment, chemicals and other non-metallic mineral products, etc.	38	37.25
Ownership		
State owned	5	4.90
Private	76	74.51
Foreign owned	7	6.86
Other	14	13.73
Number of employees		
<100	10	9.80
100–299	33	32.35
300–499	21	20.59
500–999	17	16.67
≥1,000	21	20.59
Number of years since established		
<5	17	16.67
5–9	43	42.16
10–19	34	33.33
≥20	8	7.84

exploration and exploitation was generated as the measure for ambidextrous innovation (Gibson & Birkinshaw, 2004; He & Wong, 2004). Firms with higher exploration and exploitation will have a higher value in ambidextrous innovation. As a robustness check, we also adopted the *median cut-off criterion* to define ambidexterity following He and Wong (2004). We first ranked and calculated the median values of explorative or exploitative innovation factor scores. Firms that score higher than each median value were classified as explorative or exploitative innovation, respectively. A firm was then defined as ambidextrous innovation if it belonged to both explorative and exploitative innovation groups.

In-group collectivism In extant literature, the measurement of collectivism still lacks consensus (Tsui, Nifadkar, & Ou, 2007). House et al. (2004), through a 10-year effort in the GLOBE project, developed a set of nine cultural values relating to both national and organizational culture. In their work, collectivism was distinguished into institutional collectivism and in-group collectivism (House et al., 2004). The GLOBE project, which aims to develop measurements of and examine the relationship between societal culture, organizational culture and organizational leadership, is a multi-phase and multi-method project (House, Javidan, Hanges, & Dorfman, 2002). About 150 social scientists and management scholars representing all major regions of the world were engaged in this long-term study (House et al., 2002). Responses to approximately 17,000 questionnaires from middle managers of 825 organizations in 61 countries gave GLOBE a sufficiently large sample size to examine the reliability and validity of those constructs (House et al., 2002). Based on these facts, in-group collectivism has been taken as a refinement of Hofstede's (1980) individualism-collectivism scale (Sturman, Shao, & Katz, 2012), which refers to individuals' pride and loyalty in the membership of their organization and their affective identification towards the organization (House et al., 2004). Thus, following Fu et al. (2004), we adopted the *in-group collectivism* measurement to investigate its effects on the ambidextrous innovation.

Centralization Following Jansen et al. (2012), we adopted the measurement of hierarchy of authority developed by Hage and Aiken (1967). The five-item scale reflects the extent to which decision-making authority is concentrated at higher hierarchies within the firm. Different from the controversy of collectivism measurement, this measurement of centralization is widely used in prior studies and has been found to be reliable and valid (Dewar, Whetten, & Boje, 1980; Jansen et al., 2006).

Control variables To control for the effects of other factors on innovation activities, we included firm age, firm size and industry as control variables (Li, Zhou, & Shao, 2009). *Firm age* was measured by the number of years that the firm had been in operation by the year 2010. We used the natural logarithm of the number of the employees to measure *firm size*. We also controlled the effect of *industry* by adding industry dummies. As technological capability usually plays an important role in innovation activities, we control the effect of *technological capability* with measures from Zhou and Wu (2010) assessing a firm's ability to use various technologies. We also controlled for *environmental uncertainty* with a scale adopted from Zhang and Li (2010). We present the summary statistics and correlations of variables in Table 2.

Construct reliability and validity

We assessed the construct validity of our perceptual measures by estimating a measurement model (see Appendix, Table 5). The model provides a satisfactory model fit, as the ratio of chi-square to the degree of freedom is 1.84, which is smaller than 2 (comparative fit index [CFI] = .92, incremental fit index [IFI] = .92; root mean square error of approximation [RMSEA] = .091) (Anderson & Gerbing, 1988). All factor loadings are highly significant ($p < .001$), and the composite reliabilities (CR) of all constructs (.83–.93) exceed the .70 benchmark. All average variances extracted (AVE) are greater than .50. As a whole, the measures demonstrate adequate convergent validity and reliability (Fornell & Larcker, 1981; Li et al., 2009).

We also examined the discriminant validity of the measures by running chi-square difference tests for all constructs in pairs (15 tests) to determine whether the restricted model (correlation fixed at 1) is significantly worse than the freely estimated model (correlation estimated freely). All chi-square differences are highly significant (e.g., collectivism vs. centralization: $\Delta\chi^2(1) = 179, p = .000$), in support of discriminant validity. We also calculated the shared variance between all possible pairs of constructs to determine whether they are lower than the AVE of the individual constructs (Zhou & Xu, 2012). For each construct, the AVE is much higher than its highest shared variance (HSV) with other constructs, which provides additional support for discriminant validity (Fornell & Larcker, 1981; Zhou & Xu, 2012). These results indicate that our measures have adequate reliability and validity.

Analyses and results

Table 3 presents the estimation results. We took a hierarchical approach, in which we first included the control variables in the model. We then added the focal variable of collectivism, and finally, we included the interaction term of collectivism and centralization to test the moderating effect (Li et al., 2009). To correct for heteroscedasticity, we applied a Huber-White sandwich estimator and provide robust standard errors, which is considered a more conservative estimation procedure (Rothaermel & Alexandre, 2009).

With Hypothesis 1, we considered the effect of collectivism on ambidextrous innovation. As Table 3 shows, collectivism is positively and significantly related to ambidextrous innovation in Model 2 ($\beta = .391, p < .001$), which is in support of Hypothesis 1.

With Hypothesis 2, we addressed the moderating role of centralization on the relationship between collectivism and ambidextrous innovation. Consistent with our prediction, the effect of the interaction between collectivism and centralization on ambidextrous innovation is negative and statistically significant at the 10 % level in Model 3 ($\beta = -.139, p = .07$).

Furthermore, we conducted a robustness check with the median-cut-off indicator of ambidexterity following He and Wong (2004). Firms that score higher than both median values in explorative or exploitative innovation were assigned one as ambidextrous innovation; otherwise, they were assigned zero. Because a dummy dependent variable as a proxy for ambidexterity was taken, *probit* regression models were estimated. Table 4 presents the estimation results of probit models and the marginal

Table 2 Mean, standard deviation and correlations

Variables	1	2	3	4	5	6	7	8	9	10	11
1. Exploration	1.00										
2. Exploitation	.60***	1.00									
3. Exploration×Exploitation	.91***	.86***	1.00								
4. In-group collectivism	.45***	.47***	.50***	1.00							
5. Centralization	.24*	.14	.23*	.08	1.00						
6. Firm age	.05	-.15	-.04	-.07	-.06	1.00					
7. Firm size	-.06	-.03	-.04	.01	-.03	.41***	1.00				
8. Industry dummy 1	.16 [†]	.12	.16	.04	.20*	.05	.12	1.00			
9. Industry dummy 2	-.01	-.16	-.06	.12	-.20*	-.00	.14	-.36***	1.00		
10. Technological capability	.40***	.39***	.44***	.32**	.15	.21*	.14	.16	-.11	1.00	
11. Environmental uncertainty	.10	.14	.12	.09	.20*	-.03	-.06	-.05	-.09	.02	1.00
Mean	3.93	4.16	16.64	5.67	3.60	11.26	5.91	.24	.29	5.18	3.59
SD	.73	.61	4.81	.95	.69	11.08	1.16	.43	.46	.95	1.22

[†] $p < .1$, * $p < .05$, ** $p < .01$, *** $p < .001$

Table 3 Results from OLS models estimating *Exploitation* × *Exploration*

	Model 1	Model 2	Model 3
Firm age	-.100	-.044	-.058
Firm size	-.068	-.064	-.058
Industry dummy 1	.103	.077	.073
Industry dummy 2	.065	-.012	-.006
Technological capability	.436***	.297**	.329***
Environmental uncertainty	.086	.050	.042
Centralization	.136	.128	.167*
Collectivism		.391***	.405***
Collectivism × Centralization			-.139 [†]
F-statistic	3.81**	9.81***	9.08***
R ²	.252	.381	.397

Standardized coefficients are reported

[†] $p < .1$, * $p < .05$, ** $p < .01$, *** $p < .001$

effect of each independent variable at their mean value in the full model. As shown in Table 4, the coefficient of collectivism is also significant and has the expected sign (Model 5: $\beta = .310$, $p < .05$). The coefficient of the interaction term between collectivism and centralization is negative and statistically significant (Model 6: $\beta = -.477$, $p < .01$). Following the suggestions from Wiersema and Bowen (2009), we also calculated the marginal effect of collectivism and its interaction with centralization on ambidexterity. The marginal effect of collectivism is .160 ($p < .01$), while the marginal effect

Table 4 Results from *probit* models estimating *Ambidexterity*

	Model 4	Model 5	Model 6	Marginal effect
Firm age	-.026 [†]	-.021	-.026 [†]	-.010 [†]
Firm size	.112	.104	.127	.051
Industry dummy 1	.048	.005	-.003	-.001
Industry dummy 2	-.147	-.281	-.221	-.088
Technological capability	.333*	.239	.339*	.135*
Environmental uncertainty	.029	-.004	-.026	-.010
Centralization	.180	.188	.340*	.135*
Collectivism		.310*	.402**	.160**
Collectivism × Centralization			-.477**	-.190**
Constant	-.228	-.184	-.290	
Wald χ^2	10.61	15.17 [†]	17.12*	
Pseudo R ²	.092	.125	.180	
Log pseudolikelihood	-63.906	-61.610	-57.750	

z statistics in parentheses

[†] $p < .1$, * $p < .05$, ** $p < .01$, *** $p < .001$

of the interaction term is -0.19 ($p < .01$). These results lend further support to both Hypotheses 1 and 2.

Discussion

In this study, we looked at a cultural antecedent of ambidextrous innovation and found strong evidence that collectivism at the organizational level is remarkably beneficial to ambidextrous innovation, conquering the possible tension between exploration and exploitation, especially through balancing organizational members' personal drivers of discipline and passion (Andriopoulos & Lewis, 2009). We also found that a centralized structure can weaken the positive effect of collectivism on ambidextrous innovation. In conclusion, this study contributes to organizational effectiveness theory and innovation management literature in three aspects.

First and foremost, we try to make extensions of the *contextual ambidexterity* (Gibson & Birkinshaw, 2004) by specifying an even more specific dimension—collectivistic culture—to solve the tension between explorative and exploitative innovation. Our study can be observed as the first attempt to examine the relationship between collectivistic culture at the organizational level and ambidextrous innovation (Morris et al., 1994). We argue that collectivistic culture within an organization may induce a higher level of OCB and ease the social loafing effect. The higher level of OCB changes the criteria of individual members for what knowledge will be created, what knowledge shall be committed to memory or forgotten, and what knowledge shall be learned from others. For the sake of organizational benefits and success, members within the collectivism oriented organization can balance the tension in discipline and passion drivers in knowledge creation, retention, and transfer, thus helping achieve ambidextrous innovation. The lessened social loafing effect will motivate members to make more efforts to balance between explorative and exploitative innovation. Therefore, by adding the culture concerns in ambidexterity, we extend the contextual ambidexterity (Gibson & Birkinshaw, 2004) and organizational effectiveness, and show that collectivism can help overcome the tension in personal drivers and then achieve balance between exploration and exploitation in all aspects of organizational learning.

Second, we try to examine the moderating effect of organizational structure on the relationship between collectivistic culture and ambidextrous innovation, which goes beyond existing literature that has identified structure-based solution and context-based solution in achieving ambidexterity, respectively. A centralized structure may collide with organizational members' spirits of dedication and sacrifice (Pierce & Delbecq, 1977) and thus reduce their OCB. Moreover, it may exaggerate social loafing within the organization. Therefore, centralization is likely to offset the positive effect that collectivism have on balancing the tension in ambidextrous innovation. This finding is also consistent with prior research, which suggests that organizations with a collectivism orientation are more likely to adopt substantial joint decision-making instead of centralized structures (Yan, Zhao, & Baron, 2007). By confirming the negative moderating effect of centralization on the relationship between collectivism and ambidextrous innovation, we suggest more evidence on how the interaction of organizational structure and organizational context affects ambidextrous innovation, which provides further insights into the solutions of ambidexterity.

Last, we extend the discussion of specific tension in ambidextrous innovation and organizational learning. While the tension between exploration and exploitation have been acknowledged pervasively in previous studies (Fang et al., 2010; He & Wong, 2004; March, 1991), few studies have furthered our understanding of the specific tension that firms confront in pursuing ambidextrous innovation. Consequently, no prior research sets out from the specific tension to propose appropriate schemes for enabling ambidexterity. Instead, this study focuses on solving the tension between discipline and passion in personal drivers (Andriopoulos & Lewis, 2009) and explores whether collectivistic culture can alleviate this tension and thus achieve ambidextrous innovation within a firm.

Managerial implications

We believe that our study has some crucial implications for innovation management practice. Foremost, managers need to be aware of the potential tension arising from an ambidextrous innovation strategy. Though ambidextrous innovation may have a lasting positive effect on firms' performance, it may cause profound tension in general and paradoxical personal drivers in particular. Such tension in personal drivers manifests in conflicts between discipline and passion. Our study suggests that managers can establish a collectivistic culture with a focus on the development of OCB and the ease of social loafing among organizational members. By attenuating the tension in personal drivers through collectivistic culture, managers are more likely to allow individual members to spontaneously shift their attention, time, and resources between explorative and exploitative activities.

Furthermore, though managers may take great pains to create segmented structure to implement an ambidextrous innovation strategy, our study suggests that a more profound approach is to establish a collectivistic culture within the organization and allow employees to balance between exploration and exploitation. As collectivistic culture encourages both organizational compliance and individual zeal for challenge, establishing a collectivistic culture is likely to balance the tension between discipline and passion in employees' personal drivers aligning with organizational objectives. Senior managers may be explicitly aware of the higher-order role of culture development in promoting ambidextrous innovation.

Third, when developing a collectivistic culture, senior managers need to be aware of the culture-structure fit in their effort to enhance ambidextrous innovation. Our study suggests that the effect of collectivism on ambidextrous innovation will be weakened in a centralized hierarchy system. When both collectivism and centralized structure prevail in emerging countries, we have to remind senior managers that the coexistence of collectivism and centralization can be negatively associated with ambidexterity and managerial efficiency. It is better to organize the firm with high collectivistic culture in a decentralized manner to achieve ambidextrous innovation.

Limitations and future research

There are some limitations in this study that future research may address. First, while we tested our hypotheses based on the Chinese context, which is a collectivistic society,

we did not exclude the influence of national culture. However, there may be some joint effects between social culture and organizational culture (Nakata & Sivakumar, 1996). We wonder if collectivism at the organizational level is still beneficial to ambidextrous innovation of firms in individualistic countries such as the United States. Future study can test our hypotheses in the context of an individualistic culture country.

Second, we suggest collectivism can overcome the tension of personal drivers (discipline versus passion) in three stages of organizational learning (i.e., knowledge creation, retention, and transfer) to balance between exploitation and exploration and achieve ambidextrous innovation internally. However, we only examined the relationship between collectivism and ambidextrous innovation, but we did not include measures and data on discipline, passion, knowledge creation, knowledge retention, and knowledge transfer. As we mentioned above, the concepts of discipline and passion derive from the comparative case studies of Andriopoulos and Lewis (2009); they did not give specific measures about these constructs. Moreover, because such terms as knowledge creation, knowledge retention, and knowledge transfer come from organizational learning theory (Argote & Miron-Spektor, 2011), they are difficult to measure, which accounts for the lack of systematic and empirical research on organizational learning theory (Miner & Mezas, 1996). Future study may address our limitations by examining the effect of OCB and social loafing on ambidextrous innovation, and further by developing measurement scales of discipline, passion, and the constructs concerning organizational learning theory.

Third, despite the satisfactory validity and reliability of our measures, some of the indexes for the goodness of fit are not satisfactory (RMSEA higher than .08). The relatively small sample size may account for this imperfection. The value of RMSEA can be overestimated when we exercise a small sample research (Bentler & Yuan, 1999). The inevitable common method bias in self-report survey may be another reason since it may cause spurious correlation and multicollinearity between indicators (Marsh, Dowson, Pietsch, & Walker, 2004). Additionally, although we adopted the standard and widely-used measurement scales from literature, our results may be affected by the rhetoric of the question items. We used positively phrased items for collectivism and negatively phrased items for centralization. Respondents may have been affected by this rhetoric. Future study may test our hypotheses with an enlarged sample and multiple or objective measures.

Finally, as we examined the specific tension in personal drivers proposed by Andriopoulos and Lewis (2009) to set out our arguments and tests, we have not covered the other two paradoxes, that is, strategic intent and customer orientation. We only demonstrated that collectivism can be a solution to the tension between discipline and passion. Future research may provide more insightful evidence to the other two paradoxes between exploration and exploitation.

Acknowledgments The authors are grateful to the comments by anonymous reviewers, and thank the supports by China National Natural Science Foundation [70902010, 71071064, 71232001, 71172090] and Self-dependent Innovation Foundation of Huazhong University of Science and Technology [no. 2013WT003].

Appendix

Table 5 Measurement items and validity assessment

Overall model fit: $\chi^2(284) = 523.37, p < .001; \chi^2/df = 1.84; CFI = .92; IFI = .92; RMSEA = .091$ SFL	
<i>Explorative innovation:</i> From He and Wong (2004). CR = .89, AVE = .68, HSV = .45	
(1) Introduce new generation of products and services	.86
(2) Extend product range	.90
(3) Open up new markets	.72
(4) Enter new technology fields	.80
<i>Exploitative innovation:</i> From He and Wong (2004). CR = .89, AVE = .67, HSV = .45	
(1) Improve existing product quality	.76
(2) Improve production flexibility	.86
(3) Reduce production cost	.81
(4) Improve yield or reduce material consumption	.85
<i>In-group collectivism:</i> From House et al. (2004). CR = .90, AVE = .64, HSV = .35	
(1) In this organization, group members take pride in the individual accomplishments of their group manager	.64
(2) In this organization, group managers take pride in the individual accomplishments of group members	.85
(3) In this organization, employees feel loyalty to the organization	.87
(4) Members of this organization take pride in working for the organization	.82
(5) This organization shows loyalty towards employees	.79
<i>Centralization:</i> From Hage and Aiken (1967). CR = .83, AVE = .50, HSV = .05	
(1) There can be little action taken here until a supervisor approves a decision	.54
(2) A person who wants to make his own decisions would be quickly discouraged	.68
(3) Even small matters have to be referred to someone higher up for a final decision	.75
(4) Unit members need to ask their supervisor before they do almost anything	.84
(5) Most decisions people make here have to have their supervisor's approval	.69
<i>Technological capability:</i> From Zhou and Wu (2010). CR = .93, AVE = .73, HSV = .22	
Compared to your major competitors, how would you evaluate your firm's capabilities in the following areas:	
(1) Acquiring important technology information	.84
(2) Identifying new technology opportunities	.88
(3) Responding to technology changes	.88
(4) Mastering the state-of-art technologies	.83
(5) Developing a series of innovations constantly	.84
<i>Environmental uncertainty:</i> From Zhang and Li (2010). CR = .93, AVE = .81, HSV = .05	
(1) It has been difficult to forecast how technologies will change in this industry	.86
(2) Competitors' actions have been highly unpredictable	.86
(3) Product market conditions have been changing very fast	.97

SFL standardized factor loading, CR composite reliability, AVE average variance extracted, HSV highest shared variance with other constructs

References

- Aiken, M., & Hage, J. 1966. Organizational alienation: A comparative analysis. *American Sociological Review*, 31(4): 497–507.
- Anderson, J. C., & Gerbing, D. W. 1988. Structural equation modeling in practice: A review and recommended two-step approach. *Psychological Bulletin*, 103(3): 411–423.
- Andriopoulos, C., & Lewis, M. W. 2009. Exploitation-exploration tensions and organizational ambidexterity: Managing paradoxes of innovation. *Organization Science*, 20(4): 696–717.
- Argote, L., & Ingram, P. 2000. Knowledge transfer: A basis for competitive advantage in firms. *Organizational Behavior and Human Decision Processes*, 82(1): 150–169.
- Argote, L., & Miron-Spektor, E. 2011. Organizational learning: From experience to knowledge. *Organization Science*, 22(5): 1123–1137.
- Bartel, C. A., & Garud, R. 2009. The role of narratives in sustaining organizational innovation. *Organization Science*, 20(1): 107–117.
- Bechtoldt, M. N., De Dreu, C. K. W., Nijstad, B. A., & Choi, H. S. 2010. Motivated information processing, social tuning, and group creativity. *Journal of Personality and Social Psychology*, 99(4): 622–637.
- Benner, M. J., & Tushman, M. L. 2003. Exploitation, exploration, and process management: The productivity dilemma revisited. *Academy of Management Review*, 28(2): 238–256.
- Bentler, P. M., & Yuan, K. H. 1999. Structural equation modeling with small samples: Test statistics. *Multivariate Behavioral Research*, 34(2): 181–197.
- Bhatt, G. D. 2000. Information dynamics, learning and knowledge creation in organizations. *Learning Organization*, 7(2): 89–99.
- Birkinshaw, J., & Gibson, C. 2004. Building ambidexterity into an organization. *MIT Sloan Management Review*, 45: 47–55.
- Brislin, R. W. 1986. The wording and translation of research instruments. In W. J. Lonner & J. W. Berry (Eds.). *Field methods in crosscultural research*: 137–164. Newbury Park: Sage.
- Bunderson, J. S., & Reagans, R. E. 2011. Power, status, and learning in organizations. *Organization Science*, 22(5): 1182–1194.
- Caldwell, C. 2011. Duties owed to organizational citizens—Ethical insights for today's leader. *Journal of Business Ethics*, 102(3): 343–356.
- Cameron, K. S. 1986. Effectiveness as paradox: Consensus and conflict in conceptions of organizational effectiveness. *Management Science*, 32(5): 539–553.
- Cardinal, L. B. 2001. Technological innovation in the pharmaceutical industry: The use of organizational control in managing research and development. *Organization Science*, 12(1): 19–36.
- Chen, C. C., Chen, X.-P., & Meindl, J. R. 1998. How can cooperation be fostered?: The cultural effects of individualism-collectivism. *Academy of Management Review*, 23(2): 285–304.
- Chen, C. C., Peng, M. W., & Saporito, P. A. 2002. Individualism, collectivism, and opportunism: A cultural perspective on transaction cost economics. *Journal of Management*, 28(4): 567–583.
- Child, J. 1972. Organization structure and strategies of control: A replication of the Aston study. *Administrative Science Quarterly*, 17(2): 163–177.
- Cohen, W. M., & Levinthal, D. A. 1990. Absorptive capacity: A new perspective on learning and innovation. *Administrative Science Quarterly*, 35(1): 128–152.
- Comer, D. R. 1995. A model of social loafing in real work groups. *Human Relations*, 48(6): 647–667.
- Criscuolo, C., & Martin, R. 2004. An emerging knowledge-based economy in China?: Indicators from OECD databases. OECD Science, Technology and Industry Working Paper no. 2004/04. doi:10.1787/256502026705.
- Cross, R., & Sproull, L. 2004. More than an answer: Information relationships for actionable knowledge. *Organization Science*, 15(4): 446–462.
- Darr, E. D., & Kurtzberg, T. R. 2000. An investigation of partner similarity dimensions on knowledge transfer. *Organizational Behavior and Human Decision Processes*, 82(1): 28–44.
- Datta, D. K., Guthrie, J. P., & Wright, P. M. 2005. Human resource management and labor productivity: Does industry matter?. *Academy of Management Journal*, 48(1): 135–145.
- Denison, D. R. 1990. *Corporate culture and organizational effectiveness*. Oxford: John Wiley & Sons.
- Denison, D. R., & Mishra, A. K. 1995. Toward a theory of organizational culture and effectiveness. *Organization Science*, 6(2): 204–223.

- Dewar, R. D., Whetten, D. A., & Boje, D. 1980. An examination of the reliability and validity of the Aiken and Hage scales of centralization, formalization, and task routineness. *Administrative Science Quarterly*, 25(1): 120–128.
- Doney, P. M., Cannon, J. P., & Mullen, M. R. 1998. Understanding the influence of national culture on the development of trust. *Academy of Management Review*, 23(3): 601–620.
- Drazin, R., & Schoonhoven, C. B. 1996. Community, population, and organization effects on innovation: A multilevel perspective. *Academy of Management Journal*, 39(5): 1065–1083.
- Duncan, R. B. 1976. The ambidextrous organization: Designing dual structures for innovation. In R. H. Kilmann, L. R. Pondy, & D. P. Slevin (Eds.). *The management of organization: Strategy and implementation*: 167–188. New York: North-Holland.
- Earley, P. C. 1989. Social loafing and collectivism: A comparison of the United States and the People's Republic of China. *Administrative Science Quarterly*, 34(4): 565–581.
- Earley, P. C., & Gibson, C. B. 1998. Taking stock in our progress on individualism-collectivism: 100 years of solidarity and community. *Journal of Management*, 24(3): 265–304.
- Erez, M., & Nouri, R. 2010. Creativity: The influence of cultural, social, and work contexts. *Management and Organization Review*, 6(3): 351–370.
- Fang, C., Lee, J., & Schilling, M. A. 2010. Balancing exploration and exploitation through structural design: The isolation of subgroups and organizational learning. *Organization Science*, 21(3): 625–642.
- Fiol, C. M., & Lyles, M. A. 1985. Organizational learning. *Academy of Management Review*, 10(4): 803–813.
- Fornell, C., & Larcker, D. F. 1981. Evaluating structural equation models with unobservable variables and measurement error. *Journal of Marketing Research*, 18(1): 39–50.
- Fu, P. P., Kennedy, J., Tata, J., Yukl, G., Bond, M. H., Peng, T. K., Srinivas, E. S., Howel, J. P., Prieto, L., Koopman, P., Boonstra, J. J., Pasa, S., Lacassagne, M. F., Higashide, H., & Cheosakul, A. 2004. The impact of societal cultural values and individual social beliefs on the perceived effectiveness of managerial influence strategies: A meso approach. *Journal of International Business Studies*, 35(4): 284–305.
- Garicano, L., & Wu, Y. H. 2012. Knowledge, communication, and organizational capabilities. *Organization Science*, 23(5): 1382–1397.
- Ghoshal, S., & Bartlett, C. A. 1994. Linking organizational context and managerial action: The dimensions of quality of management. *Strategic Management Journal*, 15(S2): 91–112.
- Gibson, C. B., & Birkinshaw, J. 2004. The antecedents, consequences, and mediating role of organizational ambidexterity. *Academy of Management Journal*, 47(2): 209–226.
- Goncalo, J. A., & Staw, B. M. 2006. Individualism-collectivism and group creativity. *Organizational Behavior and Human Decision Processes*, 100(1): 96–109.
- Graham, J. W., & Van Dyne, L. 2006. Gathering information and exercising influence: Two forms of civic virtue organizational citizenship behavior. *Employee Responsibilities and Rights Journal*, 18(2): 89–109.
- Hage, J., & Aiken, M. 1967. Program change and organizational properties a comparative analysis. *American Journal of Sociology*, 72(5): 503–519.
- Harkins, S. G. 1987. Social loafing and social facilitation. *Journal of Experimental Social Psychology*, 23(1): 1–18.
- He, Z. L., & Wong, P. K. 2004. Exploration vs. exploitation: An empirical test of the ambidexterity hypothesis. *Organization Science*, 15(4): 481–494.
- Hofstede, G. 1984. *Culture's consequences: International differences in work-related values*. Newbury Park: Sage.
- Holmqvist, M. 2004. Experiential learning processes of exploitation and exploration within and between organizations: An empirical study of product development. *Organization Science*, 15(1): 70–81.
- House, R. J., Hanges, P. J., Javidan, M., Dorfman, P. W., & Gupta, V. 2004. *Culture, leadership, and organizations: The GLOBE study of 62 societies*. Thousand Oaks, CA: Sage.
- House, R., Javidan, M., Hanges, P., & Dorfman, P. 2002. Understanding cultures and implicit leadership theories across the globe: An introduction to project GLOBE. *Journal of World Business*, 37(1): 3–10.
- Hui, C. H., & Triandis, H. C. 1986. Individualism-collectivism: A study of cross-cultural researchers. *Journal of Cross-Cultural Psychology*, 17(2): 225–248.
- Jansen, J. J. P., Simsek, Z., & Cao, Q. 2012. Ambidexterity and performance in multiunit contexts: Cross-level moderating effects of structural and resource attributes. *Strategic Management Journal*, 33(11): 1286–1303.
- Jansen, J. J. P., Van den Bosch, F. A. J., & Volberda, H. W. 2006. Exploratory innovation, exploitative innovation, and performance: Effects of organizational antecedents and environmental moderators. *Management Science*, 52(11): 1661–1674.
- Kane, A. A., Argote, L., & Levine, J. M. 2005. Knowledge transfer between groups via personnel rotation: Effects of social identity and knowledge quality. *Organizational Behavior and Human Decision Processes*, 96(1): 56–71.

- Karau, S. J., & Williams, K. D. 1993. Social loafing: A meta-analytic review and theoretical integration. *Journal of Personality and Social Psychology*, 65(4): 681–706.
- Kerr, N. L., & Bruun, S. E. 1983. Dispensability of member effort and group motivation losses: Free-rider effects. *Journal of Personality and Social Psychology*, 44(1): 78–94.
- Kidwell, R. E., & Bennett, N., Jr. 1993. Employee propensity to withhold effort: A conceptual model to intersect three avenues of research. *Academy of Management Review*, 18(3): 429–456.
- Kim, H., Park, N., & Lee, J. 2014. How does the second-order learning process moderate the relationship between innovation inputs and outputs of large Korean firms?. *Asia Pacific Journal of Management*, 31(1): 69–103.
- Kwon, J.-W. 2012. Does China have more than one culture?: Exploring regional differences of work values in China. *Asia Pacific Journal of Management*, 29(1): 79–102.
- Lavie, D., & Rosenkopf, L. 2006. Balancing exploration and exploitation in alliance formation. *Academy of Management Journal*, 49(4): 797–818.
- Levin, D. Z., & Cross, R. 2004. The strength of weak ties you can trust: The mediating role of trust in effective knowledge transfer. *Management Science*, 50(11): 1477–1490.
- Levinthal, D. A., & March, J. G. 1993. The myopia of learning. *Strategic Management Journal*, 14(S2): 95–112.
- Li, Y., & Peng, M. W. 2008. Developing theory from strategic management research in China. *Asia Pacific Journal of Management*, 25(3): 563–572.
- Li, J. J., Zhou, K. Z., & Shao, A. T. 2009. Competitive position, managerial ties, and profitability of foreign firms in China: An interactive perspective. *Journal of International Business Studies*, 40(2): 339–352.
- March, J. G. 1991. Exploration and exploitation in organizational learning. *Organization Science*, 2(1): 71–87.
- Marsh, H. W., Dowson, M., Pietsch, J., & Walker, R. 2004. Why multicollinearity matters: A reexamination of relations between self-efficacy, self-concept, and achievement. *Journal of Educational Psychology*, 96(3): 518–522.
- Miner, A. S., & Mezas, S. J. 1996. Ugly duckling no more: Pasts and futures of organizational learning research. *Organization Science*, 7(1): 88–99.
- Moorman, R. H., & Blakely, G. L. 1995. Individualism-collectivism as an individual difference predictor of organizational citizenship behavior. *Journal of Organizational Behavior*, 16(2): 127–142.
- Morris, M. H., Davis, D. L., & Allen, J. W. 1994. Fostering corporate entrepreneurship: Cross-cultural comparisons of the importance of individualism versus collectivism. *Journal of International Business Studies*, 25(1): 65–89.
- Mueller, V., Rosenbusch, N., & Bausch, A. 2013. Success patterns of exploratory and exploitative innovation: A meta-analysis of the influence of institutional factors. *Journal of Management*, 39(6): 1606–1636.
- Mullen, B. 1983. Operationalizing the effect of the group on the individual: A self-attention perspective. *Journal of Experimental Social Psychology*, 19(4): 295–322.
- Nakata, C., & Sivakumar, K. 1996. National culture and new product development: An integrative review. *Journal of Marketing*, 60(1): 61–72.
- Nickerson, J. A., & Zenger, T. R. 2002. Being efficiently fickle: A dynamic theory of organizational choice. *Organization Science*, 13(5): 547–566.
- O'Reilly, C. A., & Tushman, M. L. 2004. The ambidextrous organisation. *Harvard Business Review*, 82(4): 74–81.
- Organ, D. W. 1990. The motivational basis of organizational citizenship behavior. *Research in Organizational Behavior*, 12(1): 43–72.
- Pierce, J. L., & Delbecq, A. L. 1977. Organization structure, individual attitudes and innovation. *Academy of Management Review*, 2(1): 27–37.
- Podsakoff, P. M., MacKenzie, S. B., Lee, J. Y., & Podsakoff, N. P. 2003. Common method biases in behavioral research: A critical review of the literature and recommended remedies. *Journal of Applied Psychology*, 88(5): 879–903.
- Podsakoff, P. M., MacKenzie, S. B., Paine, J. B., & Bachrach, D. G. 2000. Organizational citizenship behaviors: A critical review of the theoretical and empirical literature and suggestions for future research. *Journal of Management*, 26(3): 513–563.
- Rank, J., Pace, V. L., & Frese, M. 2004. Three avenues for future research on creativity, innovation, and initiative. *Applied Psychology*, 53(4): 518–528.
- Robert, C., & Wasti, S. A. 2002. Organizational individualism and collectivism: Theoretical development and an empirical test of a measure. *Journal of Management*, 28(4): 544–566.

- Rothaermel, F. T., & Alexandre, M. T. 2009. Ambidexterity in technology sourcing: The moderating role of absorptive capacity. *Organization Science*, 20(4): 759–780.
- Shane, S., Venkataraman, S., & MacMillan, I. 1995. Cultural differences in innovation championing strategies. *Journal of Management*, 21(5): 931–952.
- Siggelkow, N., & Levinthal, D. A. 2003. Temporarily divide to conquer: Centralized, decentralized, and reintegrated organizational approaches to exploration and adaptation. *Organization Science*, 14(6): 650–669.
- Smith, C. A., Organ, D. W., & Near, J. P. 1983. Organizational citizenship behavior: Its nature and antecedents. *Journal of Applied Psychology*, 68(4): 653–663.
- Smith, W. K., & Tushman, M. L. 2005. Managing strategic contradictions: A top management model for managing innovation streams. *Organization Science*, 16(5): 522–536.
- Sturman, M. C., Shao, L., & Katz, J. H. 2012. The effect of culture on the curvilinear relationship between performance and turnover. *Journal of Applied Psychology*, 97(1): 46–62.
- Su, Z., Li, J., Yang, Z., & Li, Y. 2011. Exploratory learning and exploitative learning in different organizational structures. *Asia Pacific Journal of Management*, 28(4): 697–714.
- Szulanski, G. 2000. The process of knowledge transfer: A diachronic analysis of stickiness. *Organizational Behavior and Human Decision Processes*, 82(1): 9–27.
- Tellis, G. J., Prabhu, J. C., & Chandy, R. K. 2009. Radical innovation across nations: The preeminence of corporate culture. *Journal of Marketing*, 73(1): 3–23.
- Triandis, H. C. 1995. *Individualism & collectivism*. Boulder, CO: Westview Press.
- Triandis, H. C., & Suh, E. M. 2002. Cultural influences on personality. *Annual Review of Psychology*, 53(1): 133–160.
- Tsui, A. S., Nifadkar, S. S., & Ou, A. Y. 2007. Cross-national, cross-cultural organizational behavior research: Advances, gaps, and recommendations. *Journal of Management*, 33(3): 426–478.
- Tushman, M. L., & O'Reilly, C. A., III. 1996. Ambidextrous organizations: Managing evolutionary and revolutionary change. *California Management Review*, 38(4): 8–30.
- Van Dyne, L., Vandewalle, D., Kostova, T., Latham, M. E., & Cummings, L. L. 2000. Collectivism, propensity to trust and self-esteem as predictors of organizational citizenship in a non-work setting. *Journal of Organizational Behavior*, 21(1): 3–23.
- Wagner, J. A., & Moch, M. K. 1986. Individualism-collectivism: Concept and measure. *Group & Organization Management*, 11(3): 280–304.
- Wally, S., & Baum, J. R. 1994. Personal and structural determinants of the pace of strategic decision making. *Academy of Management Journal*, 37(4): 932–956.
- Wang, D., Xue, H., & Su, H. 2010. Influence of work support on employee creativity: An empirical examination in the Peoples Republic of China. *African Journal of Business Management*, 4(8): 1546–1553.
- Wang, L., Hinrichs, K., Prieto, L., & Howell, J. 2013. Five dimensions of organizational citizenship behavior: Comparing antecedents and levels of engagement in China and the US. *Asia Pacific Journal of Management*, 30(1): 115–147.
- Wiersema, M. F., & Bowen, H. P. 2009. The use of limited dependent variable techniques in strategy research: Issues and methods. *Strategic Management Journal*, 30(6): 679–692.
- Wong, A., & Tjosvold, D. 2006. Collectivist values for learning in organizational relationships in China: The role of trust and vertical coordination. *Asia Pacific Journal of Management*, 23(3): 299–317.
- Yan, L., Zhao, H., & Baron, R. A. 2007. Influence of founder-CEOs' personal values on firm performance: Moderating effects of firm age and size. *Journal of Management*, 33(5): 673–696.
- Yao, X., Wang, S., Dang, J., & Wang, L. 2012. The role of individualism-collectivism in the individual creative process. *Creativity Research Journal*, 24(4): 296–303.
- Zhan, W., & Chen, R. 2013. Dynamic capability and IJV performance: The effect of exploitation and exploration capabilities. *Asia Pacific Journal of Management*, 30(2): 601–632.
- Zhang, Y., & Li, H. 2010. Innovation search of new ventures in a technology cluster: The role of ties with service intermediaries. *Strategic Management Journal*, 31(1): 88–109.
- Zhou, K. Z., & Li, C. B. 2007. How does strategic orientation matter in Chinese firms?. *Asia Pacific Journal of Management*, 24(4): 447–466.
- Zhou, K. Z., & Wu, F. 2010. Technological capability, strategic flexibility, and product innovation. *Strategic Management Journal*, 31(5): 547–561.
- Zhou, K. Z., & Xu, D. 2012. How foreign firms curtail local supplier opportunism in China: Detailed contracts, centralized control, and relational governance. *Journal of International Business Studies*, 43(7): 677–692.

Zhi Yang (PhD, University of Hong Kong) is an associate professor of strategic management at the School of Management, Huazhong University of Science and Technology. He received the PhD at the School of Business, University of Hong Kong. His research interests are innovation management, strategic management, and international business, in particular in the context of emerging economies. He has taught in the areas of strategic management and innovation management.

Xuemin Zhou is a PhD Candidate at the School of Management, Huazhong University of Science and Technology. She is currently the Analyst of Alliance PKU Management Consultants Ltd. Her research interests include strategic human resources management, innovation management, and strategic management.

Pengcheng Zhang (PhD, Huazhong University of Science and Technology) is an associate professor in the School of Management at Huazhong University of Science and Technology. He enjoyed a visiting scholarship at Rice University, USA. His research interests include innovation management, organizational behavior, and business ethics.