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Perceived Organisational Climate, Knowledge Transfer, and Innovation in China-based Research & Development Companies

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PERCEIVED ORGANISATIONAL CLIMATE, KNOWLEDGE TRANSFER, AND INNOVATION IN CHINA-BASED RESEARCH & DEVELOPMENT COMPANIES

ABSTRACT

In this study, we integrate three concepts: perceived organisational climate, knowledge transfer, and individual innovation. Relationships of organisational climate with innovation have been studied mainly in Western countries. We test three sets of hypotheses that compare two groups of Chinese research and development (R&D) professionals: those working for Chinese companies (CCs); and those working for China-based subsidiaries of U.S. companies (ACs). The findings support two conclusions: 1) organisational climate constructs show relevance in China and 2) company origin matters: the two groups of Chinese professionals show somewhat different patterns of climate-knowledge transfer-innovation relationships.

Keywords: Individual innovation; organisational climate; China-based-R&D companies.

INTRODUCTION

In recent years, technology-intensive multinational enterprises (MNEs) have rapidly increased their R&D activities in China (Von Zedtwitz 2004). The number of China-based foreign R&D organisations grew from 200 in 2004 to 1160 in 2007, with U.S. companies forming the largest group (Thorpe 2008). These organisations increasingly employ local staff rather than expatriates. In the meantime, indigenous Chinese R&D organisations also have grown rapidly (Thorpe 2008). Given the focus of R&D on innovation, a key question is whether processes of innovation differ between multinational versus indigenous Chinese companies. If such processes are similar, then Western theories should apply to Chinese companies. If they are not, China's increasing importance in economic terms justifies attempts to clarify the differences. Therefore, the question we investigate is whether findings from Western theories on organisational climate-innovation relationships can be extended to China.

To explore this question, we first examine how Chinese and American cultures may frame the climate for innovation in Chinese- versus American-based companies. We compare dimensions related to innovation by R&D personnel in two types of China-based companies, specifically, indigenous Chinese R&D companies (CCs) and China-based U.S. R&D companies (ACs). We argue that features of perceived organisational climate should relate differently to innovation and knowledge transfer by employees in these two types because of the contrasting cultural orientations of their countries of origin.

Although national culture is societal in level, it translates into companies through influencing the core values and beliefs that constitute their organisational cultures (Hofstede, Neuijen, Ohayv and Sanders 1990). Organisational culture manifests itself most clearly through company policies and practices. Employee reactions to these policies and practices form the basis for their perceptions of organisational climate. The relationships of these perceptions with their tendencies to transfer knowledge and innovate serves as our central focus (Van Muijen, Koopman, DeWitte, DeCock, Zoran, Lemoine, Dimitri, Papalexandris, Branyicski, Spaltro, Jesiuno, Gonzalves Das Neves, Pitariu, Konrad, Peiro, Gonzalez-Roma and Turnipseed 1999).

The two most often studied national cultural dimensions are individualism/collectivism and power distance (Hofstede 1991). Individualism/collectivism depicts the relationship between the individual and the collectivity that prevails within a society. Power distance concerns the degree to which members of a collective expect power and authority to be distributed (Hofstede 1991). While Chinese culture is characterised as high in power distance and collectivism, American culture is comparatively low in both (Hofstede 1991). Chinese collectivist culture weighs heavily on a person's duties to family, clan and state, whereas American individualist culture values the primacy of the individual (Pan, Chaffee, Chu and Ju 1994). Regarding power distance, Chinese culture places more weight on vertical dimensions of interpersonal relationships whereas American culture emphasizes horizontal dimensions.

National cultures nurture similarities in within-nation organisational cultures because of the boundedness of culture (Hofstede 1980). Studies indicate that multinational companies from different countries apply elements of their home country human resources management policies and practices to their overseas subsidiaries (Yuen and Kee 1993). Of particular relevance to the present study is the strong tendency of American companies to attempt to transfer their organisation cultures overseas (Begley and Boyd 2003). For example, in one comparison, U.S. overseas subsidiaries exhibited greater home-country corporate influences, while Japanese overseas subsidiaries showed greater host-country cultural influences (Yuen and Kee 1993).

Organisational culture and organisational climate show clear definitional differences. Bloor and Dawson (1994) define organisational culture as a patterned system of interpretations, meanings and beliefs about an organisation that facilitates sense-making among employees. Organisational climate is defined as a set of characteristics of an organisation’s internal environment created by its policies and practices. At an individual level, perceived organisational climate is the collection of employee attitudes and beliefs about the manner in which they perform their daily jobs (Abbey and Dickson 1983; Ashkanasy, Wilderom and Peterson 2000; James and Jones 1974; Moran and Volkwein 1992). Organisational culture refers to the deep value structure of organisations, while organisational climate is direct, psychological, surface-level, and limited to the social environment. Organisational climate is considered an outer layer of organisational culture that is more proximate to employee behaviour (Denison 1996).

Organisational-climate theory and innovation

Researchers on organisational climate study the impact organisational systems have on groups and individuals (James and Jones 1974; Joyce and Slocum 1982). Individuals use this perceived information to formulate expectations of environments (James and Sells 1981) which can facilitate or inhibit their innovativeness (Amabile 1988). The terms of organisational climate, work environment, and organisational context have been used interchangeably in previous studies (Abbey and Dickson 1983; Amabile 1997; Denison 1996; Oldham and Cummings 1996; Shalley, Gilson and Blum 2000). This study focuses on a subsection of organisational climate constructs, namely, those relating to perceived organisational support for innovation.

Creativity and innovation are so closely linked that some authors use the terms interchangeably. From a process perspective, creativity is a key generation phase in a multistage innovation process that also incorporates development, adoption, and implementation of ideas (Ford 1996). However, such clear distinctions are not always easy to apply in the literature. In this paper, we include studies of creativity where authors present models and ideas that seem equally applicable to innovation.

Cohen, Ledford, & Spreitzer's study (1996) is representative of efforts to identify dimensions of organisational climate. They sought to identify climate dimensions affecting employee involvement in self-managing work teams. Similar to other studies, they generated a long list that included power to make decisions about work and business performance, information about work processes, quality, customers, business performance, competitors and organisational changes, rewards tied to performance and development of capability, training that enables employees to develop the knowledge required for effective performance, and resources of equipment, space, tools and materials that permit employees to accomplish their work.

Several researchers have examined the relationship of organisational climate with creativity and innovation. One stream looked at individual and contextual influences. Oldham and Cummings (1996) related personal characteristics of employees and characteristics of the organisational context to employee creativity and innovation. They found that high job complexity, supportive supervision with concern for employee needs, informational feedback,

freedom, and low oversight control facilitate employee creative and innovative behaviour (Oldham and Cummings 1996). Ford's Theory of Creative Individual Action (1996) positioned individual creativity as arising from the joint influences of sense making, motivation, knowledge, and ability (Ford 1996). His theory explained how these joint influences legitimise action and interact to facilitate creativity and innovation.

Another stream examined the role of the team in innovation. Anderson and West's model (1998) proposed four team climate factors to facilitate work group innovativeness: clearly defined group vision, interpersonally non-threatening participative safety, task orientation, and approval. Measures they constructed for their model demonstrated acceptable levels of reliability and validity (Anderson and West 1998).

Woodman and colleagues (1993) presented an extensive set of climate variables that included extra- and intra-organisational influences. In their Interactionist Model of Creativity, a complex set of individual behaviours, characterized as contextual and social influences and cognitive and non-cognitive aspects, either facilitates or inhibits creativity and innovation. They arise from antecedent conditions, cognitive style, ability, personality, relevant knowledge, motivation, social influences and contextual influences (Woodman, Sawyer and Griffin 1993).

Amidst the diversity of approaches, Amabile's Componential Model (1988, 1997) of creativity and innovation in organisations concentrated most directly on internal organisational climate constructs. The model posited that three main components of companies, organisational motivation to innovate, resource components in the task domain, and management practices that allow freedom and autonomy, provision of challenging work, and formation of good work teams, set favourable internal conditions for creativity and innovation to flourish (Amabile 1988; 1997; Amabile, Conti, Coon, Lazenby and Herron 1996). Their findings showed the efficacy of these components. They later broke them down into further sub-categories (Amabile et al. 1996).

As internal organisational climate is the main focus of the present study, we adopted Amabile's model with its the three major climate constructs. Regarding organisational motivation, though somewhat ambivalent, Amabile's basic stance is that extrinsic motivators

stifle creativity (Amabile 1988; Amabile et al. 1996). Since her studies on the topic were mainly lab-based, we sought to test this notion in a field setting and so chose to represent organisational motivators through extrinsic organisational rewards. Regarding resource components in the task domain, we viewed knowledge as a critical resource to the technical professionals we studied. Finally, we divided management practices into the two dimensions contained within it: empowerment (freedom, autonomy, and challenging work) and team participation (formation of good work teams). Empowerment is regarded as a climate characteristic that elicits intrinsically motivated effort.

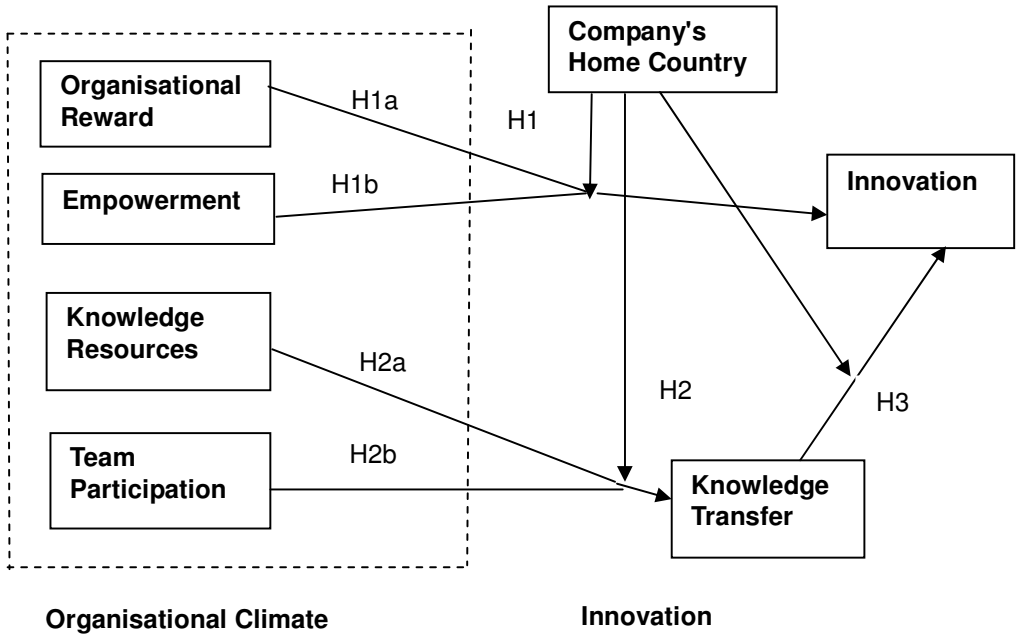
Organisational climate for innovation across countries

Little theoretical or empirical research on innovation has been done in non-Western countries (Amabile et al. 1996; Anderson and West 1998; Oldham and Cummings 1996). Nor has work has been done to compare organisational climates across countries. Most comparative research on knowledge transfer and innovation has been conducted at a national level and was limited to studying managers (Rhyne, Teagarden and Van den Panhuyzen 2002; Shane, Venkataraman and MacMillan 1995). The primary guidance for the present study is the oft-found differences in national culture and their application to individual perceptions and behaviour (Newman and Nollen 1996; Schwartz 1992). We argue that differences should exist in the relationship of perceived organisational climate with innovation in two types of R&D firms located in China: those headquartered in China versus those headquartered in the U.S. Each type should adopt management policies and practices that reflect the cultures of their corporate headquarters, therefore differing in perceived organisational climate-innovation relations among their employees. In the next section, we specify the anticipated differences.

Organisational climate with innovation

Figure 1 graphically depicts the hypothesized relationships of perceived organisational climate with knowledge transfer and innovation. As the model shows, we expect a company's home country to predict differential relationships of organisational climate with knowledge transfer and innovation. In addition, we expect knowledge transfer to mediate the relationship of team participation with innovation.

Figure 1. A model of organisational climate, knowledge transfer and innovation



Organisational rewards

A literature largely based on lab experiments has grown around the notion that extrinsic rewards often stifle creativity (see Deci, Koestner and Ryan 1999 for a review), for a review) by focusing individuals' attention on the rewards as the motivation for creativity rather than intrinsic factors. When the rewards are removed, motivation is removed. Amabile and colleagues (e.g., Amabile, Hennessey and Grossman 1986) have contributed to this literature.

The largely field-based organisational literature counterargues that professionals expect their remuneration to match their perceived worth and that high compensation should associate with organisational success and innovation (Pfeffer and Salancik 1978), as should other rewards such as working conditions, promotion, and social status. If professionals see others' innovation rewarded, they expect their own innovation to be rewarded. Companies often rely on their reward systems to encourage employee innovativeness, particularly in technology-based industries. For example, findings in the HR literature support a connection between compensation and innovation in high technology companies (Abbey and Dickson 1983; Balkin and Bannister 1993; Balkin, Markman and Gomez-Mejia 2000).

These findings are largely from studies of Americans. Their highly individualistic focus on individual accomplishment and self-interest contrasts with the Chinese collectivist focus on group harmony and conformity. For Americans, who are guided by a strong work ethic and individual goal orientation (Hofstede 1980; Lu 1999), connecting differential rewards to individual achievement may serve as an effective motivator. U.S. companies are likely to emphasize individual-based rewards in spurring innovation because differences in reward are seen as justified by differences in performance and regarded as a way to motivate such performance (Kerrin and Oliver 2002). Such rewards are less efficacious in Chinese companies because they emphasise conformity and fitting in rather individual performance. In U.S. companies, innovativeness is seen as a means to stand out from the group. In Chinese companies, it is seen as a means to contribute to the group. Therefore,

Hypothesis 1a: The positive relationship between rewards and innovation is likely to be stronger in Chinese R&D professionals working in U.S. companies in China than those working in Chinese companies in China.

Empowerment

Extrinsic rewards are depicted in the previous hypothesis. To be complete, intrinsic rewards should be included. The concept of empowerment relates closely to such features. Empowerment is defined as providing employees with job-related discretion and autonomy and elicits an individual response to a company's managerial practices (Amabile et al. 1996; Spreitzer 1995). Autonomy has connected to accelerated innovation (Amabile 1988; Pritchard and Karasick 1973; Woodman et al. 1993). Professionals work harder and perform better when they experience involvement, commitment, and shared responsibilities (Pfeffer and Salancik 1978). Freedom is reported as a key factor in promoting creativity and innovation (Amabile 1988).

Cultural differences may emerge here as well, especially in relation to power distance. Empowerment relates positively to performance and other behaviours in cultures lower in power distance. Americans' lower power distance is reflected in the policies and work practices of U.S. multinational subsidiaries around the world. Policies and practices that reflect lower power distance should connect to innovative behaviour by employees in American MNEs. Higher power distance cultures encourage autonomous action less. The higher power distance tendencies

of Chinese companies precipitates work practices that discourage empowered action. Chinese have shown relatively low levels of empowerment (Hui, Au and Fock 2004; Randolph and Sashkin 2002). Empowerment may relate better to innovation among employees in U.S.-based companies because they view autonomy as something to encourage, while employees in Chinese companies place more value on obedience to authority. Empowerment may be less relevant to the pursuit of innovation among employees in China-based R&D companies than it is in U.S.-based R&D companies. Therefore,

Hypothesis 1b: The positive relationship between empowerment and innovation is likely to be stronger in Chinese R&D professionals working in U.S. companies in China than those working in Chinese companies in China.

Organisational climate with knowledge transfer

Knowledge transfer reflects the willingness of employees to impart knowledge and discuss ideas with one another (Jaw and Liu 2003; Sinkula, Baker and Noordewier 1997). Its significance as a contributor to innovation has received support in the literature (Cohen and Levinthal 1990; Hansen 1999). The ability to transfer knowledge effectively among individuals is critical to new product innovation (Cohen and Levinthal 1990; Hansen 1999). Two theories of innovation link closely to knowledge transfer. From the knowledge-based view, combining and creating new knowledge is seen as critical to innovation (Kanter 1988; Kogut and Zander 1992). From the knowledge-management view, knowledge transfer is key to connecting knowledge generation with applications that lead to innovation (Cohen and Levinthal 1990; Nonaka 1994).

Knowledge resources

Knowledge resources have received increased attention in recent years (Cohen and Malerba 2001; Leiponen and Helfat 2004). Their availability has associated positively with innovative success in a dynamic environment (Amabile et al. 1996; Cohen and Levinthal 1990; Leiponen and Helfat 2004; Pritchard and Karasick 1973; Spreitzer 1995; Woodman et al. 1993). Organisations with substantial knowledge resources can increase the odds of innovation by facilitating employee efforts to combine prior pieces of knowledge in new ways (Cohen and Levinthal 1990; Kogut and Zander 1992; Leiponen and Helfat 2004; Nonaka 1994).

From the knowledge-based view, knowledge resources can help internal knowledge transfers (Kogut 2000; Kogut and Zander 1992). Knowledge networks, including information and relational networks, facilitate knowledge transfer (Kogut 2000; Reagans and McEvily 2003; Smith, Collins and Clark 2005). Relational networks provide efficient mechanisms to access and integrate new knowledge, especially in high-velocity environments (Kogut 2000). Effective knowledge exchange and recombination occurs when employees can access people, update relevant knowledge resources, and absorb pieces of information (Monteiro, Arvidsson and Birkinshaw 2004; Smith et al. 2005).

Knowledge transfer is facilitated when employees can use knowledge resources such as collaborative norms, informal social networks, and formal meetings to build strong connections and they encourage willingness to share knowledge (Eisenhardt and Galunic 2000; Gupta and Govindarajan 2000; Hargadon 1998). Knowledge transfer benefits from intensive employee exchanges, ease of communication and good relationships (Nonaka 1994). Frequent meetings and seminars help employees to identify technological opportunities, focus technological activities, and avoid the path of least resistance by keeping aware of best practices (Rhyne et al. 2002).

Cultural tendencies influence the relationship between knowledge resources and knowledge transfer. In cultures higher in power distance, hierarchy is a major source of status. Reaching the next rung on the ladder is a goal for many employees because it bestows greater respect and access to greater rewards. Knowledge is an important tool. Employees whose knowledge can be utilized to advantage by superiors are able to ingratiate themselves with higher ups (Ghauri and Fang 2001). Strengthening these relationships may give them credits toward future favours (Bond 1996). Thus, they may hoard knowledge until they can use it to maximum advantage.

In addition, an element of Chinese collectivism, face, affects knowledge transfer. Face refers to the respectability a person can claim in the group (Ho 1976). Concern for face instills a need to appear completely in control and knowledgeable (Hwang, Francesco and Kessler 2003; Sully De Luque and Sommer 2000). Employees who communicate knowledge may fear that it will lack value to recipients or its transmission will reveal their incomplete knowledge. This feared

loss of face deters knowledge transfer (Hwang et al. 2003).

In lower power distance cultures, more egalitarian norms create expectations that knowledge will be shared with one's peers. Such sharing may in itself advance status by positioning the person as an expert. In addition, without the strong obligations engendered by use of favours to ingratiate, less binding norms of reciprocity reduce the value of knowledge hoarding. With less concern for face, showing incomplete knowledge is less of a risk. Therefore,

Hypothesis 2a: The positive relationship between knowledge resources and knowledge transfer is likely to be stronger in Chinese R&D professionals working in U.S. companies in China than those working in Chinese companies in China.

Team participation

Team participation involves contributions to one's work groups. Several studies have supported its importance as a predictor of individual innovative behaviour (Amabile et al. 1996; Anderson and West 1998; Gilson, Mathieu, Shalley and Ruddy 2005; Pritchard and Karasick 1973; Scott and Bruce 1994; Woodman et al. 1993).

Team participation shows itself when team members interact, share information, and make decisions together (Anderson and West 1998). It is facilitated by interpersonal trust. In low trust environments, knowledge workers are reluctant to share crucial knowledge with group members for fear of losing ownership or a position of privilege (Hansen 1999; Pfeffer and Salancik 1978).. Safe environments contribute to strong emotional attachments, good relationships, and increased communication (Boland and Tenkasi 1995). They encourage mutual awareness of each member's knowledge and promote further knowledge sharing through up-close observation, demonstration, and hands-on experience (Hansen 1999; Hansen, Mors and Løvås 2005). Intra-team trust can stimulate member knowledge exchange that helps to overcome barriers to innovation (Kogut and Zander 1992; Smith et al. 2005; Szulanski 1996).

As a collectivist culture, China emphasises the role of groups, especially the family (Hofstede 1991; Triandis 1995). Managers actively seek to generate feelings of family in their units and assume paternalistic roles (Farh, Earley and Lin 1997). Collectivist cultures draw sharp

boundaries between in-groups and out-groups and seek to integrate members into strong, cohesive in-groups. In-groups are highly enduring and protect member interests in exchange for unquestioning loyalty. Patterns of interaction and mutual support are very strong within groups and weak across groups (Triandis, Botempo, Villareal, Asai and Lucca 1988). For Chinese professionals, in-group interests, relationship building, collective orientation, and shared responsibilities override individual concerns and self-actualization (Hofstede 1980), leading to high team participation that facilitates knowledge transfer. Chinese employees share knowledge significantly more with members of their in-group than individualist Americans (Chow, Deng and Ho 2000).

The primary value placed on individual over group leads Americans to distinguish less between in-groups versus out-groups, encourages higher concern for task versus relationships, reduces group allegiance, and contributes to the more ephemeral nature of group ties (Triandis et al. 1988). Therefore,

Hypothesis 2b: The positive relationship between team participation and knowledge transfer is likely to be stronger in Chinese R&D professionals working in Chinese companies in China than those working in U.S. companies in China.

Knowledge transfer and team participation with individual innovation behaviour

Previously, we established a connection between knowledge transfer and innovation and connected team participation to knowledge transfer. Here we argue that team participation relates to innovation largely through knowledge transfer, therefore introducing the latter as a mediator should minimise the team participation-innovation relationship.

Team participation has shown a positive relationship with individual innovation (Anderson and West 1998; Gilson et al. 2005; Scott and Bruce 1994; Woodman et al. 1993), but the reason for that relationship is unclear. Anderson and West (1998) suggest that team cooperation may aid innovation through promoting mutual adjustment, knowledge sharing, problem solving, and learning. These features may set the context for good working relationships, but how they connect to innovation is less clear. Whereas insights for innovative ideas occur to individuals, team participation emphasises the role of the group (Crossan, Eane and White 1999; Floyd and

Lane 2000; Scott and Bruce 1994). The groupthink concept indicates that group cohesion can stifle rather than facilitate effective problem solving (Janis 1971). Research in creativity indicates that individuals are more creative working alone than in groups (Woodman et al. 1993).

Empirical studies have argued that team participation does not relate directly to individual innovative behaviour but is mediated by other variables such as knowledge creation capability (Smith et al. 2005). We posit that knowledge transfer is a prime mechanism that mediates the team participation-innovation relationship. The close relationship of team participation with knowledge transfer and the latter with innovation leads to a largely spurious team participation-innovation relationship. Once knowledge transfer is introduced, team participation's relationship with innovation should substantially weaken.

In addition, we expect the mediating effect of knowledge transfer to be stronger in employees working in Chinese companies. In Chinese firms, the in-group mentality makes team cooperation a prerequisite for willingness to transfer information. Employees rely more on group members' aid to enhance their innovativeness. In the absence of cooperation, knowledge transfer will be minimal and its scarcity will associate with lessened innovation. In U.S.-based companies, less stress on cooperative in-group norms makes the team participation-knowledge transfer-innovation chain looser. Company policies and practices will encourage employees to rely more on their own talents to innovate.

Hypothesis 3: Knowledge transfer will more strongly mediate the relationship between team participation and innovation among Chinese R&D professionals working in Chinese companies in China than among those working in U.S. companies in China.

Methods

Sampling and data collection

We administered a questionnaire to collect data to test the three hypotheses. All instruments in the questionnaire were originally in English and most had seen prior use, some in both Western countries and China. The questionnaire was translated from English to Chinese then back to English four times by different bilingual Chinese Ph.D. students to ensure that the meaning of

items had not changed in translation (Brislin 1980). A pre-test of the resulting translation was conducted with 32 Chinese to determine whether the questions were clear. Items that were not completely clear were reworded and retested until they achieved clarity.

The main survey was conducted in Beijing, the home of many Chinese and U.S. company R&D facilities. Large-scale Chinese and U.S. R&D companies were identified from a list of the top 500 national and multinational companies in China in 2004 (Tian 2005). Out of the 50 companies that were contacted, five large high-tech Chinese R&D companies and five similar U.S. R&D companies expressed willingness to cooperate. Eight of the ten R&D facilities were Electronics Information and Communication (EIC) enterprises; two were R&D design companies. Targeted participants were R&D technical professionals, including engineers, technicians, and scientists.

In the first stage of data collection, questionnaires with cover letters and reference letters were sent to employees by the person designated as the primary liaison by each company. Liaisons included HR personnel, project managers, team leaders, and senior R&D professionals. The cover letter accompanying the questionnaire explained its purpose, its voluntary nature, and its overall intent. It also assured respondents of confidentiality and identified the fact that it was a university-based survey. Respondents were asked to complete and return their questionnaires within one to two weeks. A week after distribution, liaisons contacted those solicited to remind them of the questionnaire and request their cooperation. Valid questionnaires numbered 170 and 157 and response rates 50% and 40% in the Chinese and American company samples, respectively. In addition to questionnaire collection, five interviews were conducted in Beijing to further explore the research questions with Chinese R&D professionals. These interviews were not codified, but rather served to increase our sensitivity to the possible nuances involved in the dimensions of interest.

Instruments

Items used in each scale are presented in Table 1.

Table 1. Exploratory factor analysis for the scales used in this study

	Component					
	1	*2*	*3*	*4*	*5*	*6*
1. Empowerment						
I have significant autonomy in determining how I do my job.						0.84
I have considerable independence in determining how I do my job.						0.84
I can decide on my own how to go about doing my work.						0.85
2. Team Participation						
We share information generally in the team rather than keeping it to ourselves.	**0.63**			**0.46**		
We have a "we are in it together" attitude.	**0.66**			**0.45**		
We all influence each other.	0.63					
People keep each other informed about work-related issues in the team.	0.75					
People feel understood and accepted by each other.	0.78					
Everyone's view is listened to even if it is in a minority.	0.72					
There are real attempts to share information throughout the team.	0.82					
There is a lot of give and take.	0.81					
3. Organisational Rewards						
I have a high level of job security.				0.43		
I am satisfied with my salary.				0.64		
There are good opportunities for promotion within the company				0.74		
My working conditions are good.				0.75		
Working for this company increases my social status.				0.74		
4. Knowledge Resources						
I have work-related academic seminars, workshops, and professional meetings.					0.55	
I can access the relevant and most up-to-date documents.					0.71	
I can access the relevant customer and employee database.					0.76	
I can access the most advanced work-related personnel and electronic networks.					0.79	
5. Knowledge Transfer						
I actively share my knowledge concerning work with my co-workers.			0.78			
I proactively share my best practices.			0.73			
In my company, I would express my opinion actively.			0.61			
I interact with other people to share what I learned concerning work.			0.65			
I exchange ideas with company members from daily social life and informal meetings.			0.59			
6. Innovative Behaviours						
I search out new technologies, processes, techniques, and/or product ideas.		0.72				
I generate creative ideas.		0.74				
I promote and champions ideas to others.		0.74				
I investigate and secure funds needed to implement new ideas.		**0.52**			**0.41**	
I develop adequate plans and schedules for the implementation of new ideas.		0.67				
I am innovative.		0.75				
Cumulative variance %	28.51	39.43	47.00	53.72	58.34	62.58

Organisational rewards

We measured the organisational rewards construct with the extrinsic work motivation scale developed by Lu (1999), who administered it in Taiwan and cites two earlier papers that validated the measure. We measured the scale's five items on a 7-point Likert scale ranging from

"strongly disagree" (1) to "strongly agree" (7). The mean of 4.83 reported by Lu (1999) (the standard deviation was not reported) is roughly equal to the overall mean of 4.71 in the present study. Coefficient alpha was 0.76 in the present study and 0.73 in Lu's (1999).

Empowerment

The empowerment measure, adapted from Spreitzer's subscale of self-determination (Spreitzer 1995), measured whether individuals had a sense of choice in initiating and regulating their actions. It was assessed with three items on a 7-point Likert scale. In its original use in the U.S., it showed a mean, standard deviation, and coefficient alpha of 5.51, 0.83, and 0.81, respectively. In a subsequent adaptation by Hui et al. (2004) for hotel employees in Beijing and Toronto, statistics for the combined sample showed a mean, standard deviation, and coefficient alpha of 5.09, 1.09, and 0.78, respectively. Separate statistics were not specified for the Beijing or Toronto subsamples. The mean, standard deviation, and coefficient alpha in the present study were 4.53, 1.25, and 0.87, respectively. The mean for empowerment was about one point higher in Spreitzer's American sample than the two Chinese subsamples in the present study.

Knowledge resources

We assessed the knowledge resources construct with four items on a 5-point Likert scale ranging from "never" (1) to "always" (5). The items were identified as important knowledge resources for idea creation and innovation (Umiker 1988). This scale had not been used in a Chinese-speaking country before its use in the present study. Its coefficient alpha was 0.72.

Team participation

We measured team participation using a subscale adapted from Anderson and West's Team Climate Inventory (TCI) (Anderson and West 1998) that used a 7-point Likert scale with eight items. In its original use in the UK, it showed a mean and coefficient alpha of 5.28 and 0.89. In a subsequent adaptation by Zhang et al. (2007) to samples from high-tech firms in China, its mean and coefficient alpha were 5.42 and 0.85 (Zhang, Hempel, Han and Tjosvold 2007). The mean and coefficient alpha in the present study were 5.32 and 0.90.

Knowledge transfer

We adapted knowledge transfer from Jaw and Liu's study (2003) and assessed it with five items on a 5-point Likert scale. In its original use in Taiwan, it showed an acceptable level of reliability and validity using confirmatory factor analysis, though means and standard deviations were not reported. The current study showed a coefficient alpha of 0.81.

Innovative behaviour

We measured innovative behaviour with Scott and Bruce's scale (1994), using six items on a 5-point Likert scale. In their study, respondents were engineers, scientists, and technicians in a large centralized R&D facility of a major U.S. corporation (Scott and Bruce 1994). In its original use in the U.S., it showed a mean, standard deviation, and coefficient alpha of 3.20, 0.84, and 0.89, respectively. Chen et al. (2007) adapted it to a sample from a manufacturing company in China and its mean, standard deviation, and coefficient alpha were 3.33, 0.67, and 0.76 (Chen and Aryee 2007). In the current study, its mean, standard deviation, and coefficient alpha were 3.39, 0.65, and 0.83, respectively.

Control variables

Three demographic variables that had displayed previous connections to innovation, age, gender, and education, were chosen as control variables. Age and job tenure were found to relate to innovative behaviour (Cohen and Levinthal 1990; Mumford and Gustafson 1988). As an employee's age and tenure increased, prior knowledge and experience increased, as did innovation and knowledge transfer (Cohen and Levinthal 1990). Since age and job tenure were highly correlated (r=0.80), only age was used in this study. For gender, in one study, males perceived organisational climate more favourably than females (Kwaśniewska and Nçcka 2004). Educational level has associated with innovation through domain expertise (Amabile 1988; Mumford and Gustafson 1988).

Data analysis

We conducted exploratory factor analysis (EFA) on the scale items (see Table 1). Including coefficients ≥ 0.4, all items but three loaded cleanly on their expected factors. Two team participation items loaded modestly on the organisational rewards scale and one innovative

behaviour item loaded modestly on the knowledge resources scale. These three items were deleted. The variance in the first factor (29%) did not take the majority of total variance (63%) from all six factors, supporting the notion that common source bias may not be a problem (Williams, Cote and Buckley 1989). We used the total sample because neither the CC nor AC subsamples had sufficient valid cases to confidently assess EFA. However, EFAs conducted on the two subsamples for illustrative purposes showed similar loadings of items on factors.

Since the study assumes greater similarity within Chinese companies and within U.S.-based companies than between them, we assessed cross-group versus within-group statistics. If cross-group agreement was higher than within-group, the validity of comparing the two subsamples would be called into question. To ensure appropriate comparisons of data, we assessed within-group interrater agreement (r_{wg}) for the variables from the two subsamples (James, Demaree and Wolf 1993). In surpassing the 0.70 level, the average r_{wg} coefficients for the Chinese and American subsamples, 0.75 and 0.79, respectively, demonstrated high within-group agreement.

Results

Table 2 reports descriptive statistics and correlations for the variables used in this study. Statistics in Tables 1 and 2 were taken from unstandardized original values. Table 3 presents sets of hierarchical regressions. To test Hypotheses 1a, 1b, 2a, and 2b, we entered the demographics first, followed by the relevant perceived organisational climate variables. To test Hypothesis 3, we added a third step to assess the mediating effect. We standardized the variables to reduce the likelihood of multicollinearity (Cohen and Cohen 1983) and increase comparability (Hair, Anderson and Tatham 1987).

Table 2. Descriptive statistics, coefficient alpha reliabilities, and correlations for the two subsamples

	M/SD/CC	*α/C*	*M/SD/AC*	*α/A*	*T-test*	*AGE*	*GN*	*ED*	*KR*	*RW*	*TP*	*EMP*	*KT*	*INN*
AGE	28.8/5.63		31.3/4.35		-3.95**	1	-0.02	0.01	0.02	0.07	-0.13	0.17	0.04	0.07
GN	1.3/.44		1.3/.47		-0.90	0.13	1	0.23**	-0.02	-0.08	-0.18*	-0.06	-.34**	-0.14
ED	2.9/.56		3.6/.67		-10.81**	-0.11	0.05	1	0.09	0.01	0.11	-0.1	-0.06	-0.04
KR#	3.00/0.74	0.76	3.45/0.58	0.67	-6.01**	-0.08	0.03	0.09	1	0.22**	0.17*	0.09	0.35**	0.32**
RW	4.55/0.99	0.82	4.87/0.72	0.70	-3.31**	0.02	-0.16*	0.14	0.37**	1	0.41**	0.44**	0.30**	0.47**
TP	5.38/1.03	0.90	5.28/0.87	0.89	0.94	-0.02	-0.16*	0.01	0.21*	0.57**	1	0.29**	0.46**	0.30**
EMP	4.46/1.25	0.87	4.61/1.26	0.87	-1.09	-0.03	0.02	0.02	0.11	0.26**	0.43**	1	0.15	0.45**
KT#	3.80/0.55	0.81	3.75/0.52	0.81	0.68	0.14	-0.10	0.05	0.14	0.36**	0.52**	0.21**	1	0.35**
INN#	3.38/0.63	0.80	3.39/0.66	0.87	-0.07	0.02	-0.30**	-0.08	0.35**	0.35**	0.37**	0.17**	0.58**	1

Notes: M=Mean, SD= Standard deviation, α=Coefficient alpha, CC= Chinese sample, AC= American sample. CCs' correlations are below the diagonal, and ACs' above; The t-test column indicates statistical significance of variable means between the two subsamples.

GN= Gender (male=1, female=2), ED= Education degree (1=high school, 2=college, 3=university, 4=master, 5=Ph.D. 6= post-doctorate); KR= Knowledge resources, RW= Organisational rewards, TP= Team participation, EMP= Empowerment, KT= Knowledge transfer, INN= Innovation.

=a five-point scale, as the others = a seven-point scale; $^{**}p<0.01$; $^{*}p<0.05$.

Table 3. Results of multiple hierarchical regression analyses for Models 1, 2, and 3.

	Model 1-Innovation			*Model 2-Knowledge Transfer*			*Model 3-Innovation*		
	C	A	T-test	C	A	T-test	C	A	T-test
Age	0.01	0.02		0.03	0.01		0.01	0.02	
Gender	-0.59**	-0.14		-0.04	-0.65**		-0.59**	-0.14	
Education	-0.16	-0.02		0.17	-0.07		-0.16	-0.02	
$\triangle R^2$	0.07**	0.01		0.03	0.09**		0.07**	0.01	
Rewards	0.20*	0.27**	**-0.53 n.s.**				0.20*	0.27**	
Empowerment	0.06	0.27**	**-1.86***				0.06	0.27**	
Knowledge resources				0.03	0.27**	**-2.53****			
Team participation	0.22*	0.14		0.52**	0.47**	**0.47 n.s.**	0.22*	0.14	
$\triangle R^2$	0.16**	0.28**		0.29**	0.33**		0.16**	0.28**	
Team participation							0.01	0.08	
Knowledge transfer							0.47**	0.14	**2.60****
$\triangle R^2$							0.14**	0.01	
F- test	7.26**	8.03**		13.75**	16.92**		12.09**	7.25**	
Total R^2	0.23	0.30		0.32	0.42		0.37	0.31	
N	145	114		145	116		142	113	

Notes: C= Chinese sample, A= American sample.

Gender: male=1, female=2; Education degree: 1=high school, 2=college, 3=university, 4=master, 5=Ph.D. 6= post-doctorate;

$^{**}p<0.01$; $^{*}p<0.05$ (One-tailed); n.s.= hypothesis not supported,

Model 1 tests the relationships of rewards and empowerment with innovation. Inclusion of team participation in the model is necessary for testing Hypothesis 3. To assess whether regressed relationships were stronger in the Chinese- or U.S.-based companies, we conducted independent-sample t-tests on the comparable pairs of regression coefficients in each subsample (Dreher and Cox 2000). An unbiased t-test was conducted using a formula recommended by Pateroster and colleagues (Paternoster, Brame, Mazerolle and Piquero 1998). If the climate-innovation coefficient for one was notably larger than for the other, the t-test would be statistically significant. Using the same approach as for Model 1, Model 2 tests the relationship of knowledge resources and team participation with knowledge transfer.

Model 3 tests knowledge transfer as a mediator between team participation and innovation. Mediation rests on four conditions. First, the independent variable should associate with the mediator, i.e., team participation should associate with knowledge transfer. Second, the mediator should associate with the dependent variable, that is, knowledge transfer should associate with innovation. Third, the independent variable should associate with the dependent variable, that is, team participation should associate with innovation. Fourth, the impact of the independent variable on the dependent variable (team participation on innovation) should be reduced or negated when the mediator (knowledge transfer) is accounted for (Baron and Kenny 1986).

Results support Hypothesis 1b but not 1a. Empowerment related more strongly with innovation among professionals in the American-owned company subsample than the Chinese-owned company subsample. There was no difference between the two for organisational rewards. Results support Hypothesis 2a but not 2b. Knowledge resources related more strongly with knowledge transfer among professionals in the American-owned company subsample than the Chinese-owned company subsample. There was no difference between the two for team participation. Finally, they support Hypothesis 3. Knowledge transfer more strongly mediated the team participation with innovation relationship for the Chinese-owned company subsample than the American-owned company subsample. In fact, the Chinese sample showed a full mediator effect while the American sample showed no mediation (Muller, Judd and Yzerbyt 2005).

Although not directly related to the hypotheses, the results of the individual regressions bear

some interest. In Model 1, rewards and team participation were statistically significant in predicting innovation in the Chinese-owned company professionals, but empowerment was not. Rewards and empowerment were statistically significant among American-owned company professionals, but team participation was not. In Model 2, team participation related to knowledge transfer in Chinese-owned company professionals while knowledge resources did not. Both team participation and knowledge resources related to knowledge transfer among American-owned company professionals. In Model 3, knowledge transfer but not team participation predicted innovation in the Chinese-owned company subsample; neither worked in the American-owned company subsample. Finally, males reported more innovative behaviour and knowledge transfer activity than females.

Discussion

This study's results indicate two trends. First, variables used in the past to predict knowledge transfer and innovation in the U.S. showed relevance in Chinese samples. Second, while some variables work equally well in the two subsamples, several others work well in one but not the other. Seven relationships of variables are tested: in two, the variables are significant in both subsamples (rewards with innovation and team participation with knowledge transfer). In one, they are significant in neither (team participation with innovation when knowledge transfer is entered). In the other four, they are significant in one subsample but not the other (the significant relationships are: in model 1, team participation with innovation among employees of Chinese-owned companies and empowerment with innovation among employees of American-owned companies; in model 2, knowledge resources with knowledge transfer in employees of American owned companies; in model 3, knowledge transfer with innovation among employees of Chinese owned companies).

The basis for the predictions was an expectation that cultural differences between China and the U.S. would carry over into the policies and practices of companies from those countries. It is noteworthy that differences emerged between these two subsamples because both involved Chinese employees living in China. Despite that fact, it seems that the American company policies and practices are sufficiently strong as to lead to different patterns of relationships of perceived organisational climate variables with reported knowledge transfer and innovation.

Working for an American company seems to engender different perceptual frames in some instances whereby different factors motivate knowledge transfer and innovation than Chinese companies. We cannot push this claim too far because an alternative hypothesis exists that technical professionals with characteristics more compatible with American company practices may have pre-selected themselves into these companies.

Regardless of whether pre-selection takes place, it seems that those attempting to understand organisational climate features predicting employee knowledge transfer and innovation need to know their company's country of origin, even if the employees are from the same country. Equally, organisational climate, a more proximal derivative of organisational culture, shows some predictive ability. Of note, whereas many studies of climate use a single organisation, this study's organisational climate variable represents the combined effects of several companies from the same country.

Regarding specific relationships, in model 1 true to form the group-oriented team participation variable predicted innovation in Chinese-owned companies while the individually-oriented empowerment variable predicted it in American-owned companies. Rewards was predictive in both subsamples. No differences appeared between the subsamples in reported levels of team participation and empowerment. Rather, differences emerged in when they showed relevance. Conversely, rewards applied equally well in predicting innovation in both subsamples despite its higher average in the American companies. Since the rewards measure focused on extrinsic rewards, these findings support its positive relationship with innovation as opposed to the negative relationship with creativity found in lab-based findings in previous studies (Amabile et al. 1986; Deci et al. 1999).

Knowledge resources associated with knowledge transfer in American but not Chinese companies and its mean reported use was significantly higher in American companies. Since the scale measuring knowledge resources identified formal sources of knowledge acquisition, Chinese companies may rely more on informal means.

We predicted that knowledge transfer would mediate the team participation-innovation

relationship and that its effects would be stronger among employees in indigenous Chinese companies. Results supported a mediation effect but only among employees in Chinese companies. Previous literature supported the teamwork-with-innovation relationship, but it was not clear what mechanism was driving it, especially since groups in an Eastern context are often associated with pressures for conformity. The mediation effect provides a possible explanation. Helping team members facilitates knowledge transfer which then facilitates innovation.

Among this study's contributions, few scholars have examined employee perceptions of organisational climate across countries. Fewer have examined their comparative associations with innovation. The study's results indicate that these areas deserve further investigation. In addition, there have been few attempts to understand possible differences in characteristics of companies within one country that are headquartered in a different country. The number and size of multinational subsidiaries functioning in countries across the globe and their importance to the international business landscape makes this gap surprising. This study's findings suggest a potentially important area for inquiry among scholars interested in subsidiary management.

Whereas many studies of employee perceptions are limited to one company, data in this study come from ten companies, five each from Chinese-owned and American-owned firms. One benefit is a lessened effect of characteristics unique to a specific company. Another is that the results are more generalisable, at least among companies in industries that emphasise R&D. Also, the study extends the literature on predictors of innovation from its largely Western base into an Eastern context. Although some predictors may differ between East and West, the ability of constructs from the mainly U.S. literature to associate with innovation in China supports their applicability to China. Additional constructs may be identified that apply only in Eastern cultures or, reversing the flow, that can transfer as informative input into studies in Western countries.

Limitations and future directions

Among the study's shortcomings, the use of self-reported measures in a questionnaire raises concerns about susceptibility to common method variance. The procedures used in this study were similar to those used in other organisational climate research (Amabile et al. 1996; Anderson and West 1998), where variables were based on employees' perceptions and therefore

subjective. However, given the focus of the research, employee perceptions are exactly the elements deemed essential to their behaviour. As a check, we conducted confirmatory factor analysis (CFA) on the entire sample, as recommended by Podsakoff and colleagues (Podsakoff, MacKenzie, Podsakoff and Lee 2003). Results supported the multiple factor structure of the data, thus offering at least some reassurance that common method variance did not play a major role. Nevertheless, research using more objective data from sources such as supervisors and coworkers would be useful as an additional check on the robustness of the relationships. We attempted to collect data from supervisors but could only secure 80 matched pairs of supervisor-employee responses.

Features of perceived organisational climate other than those used in this study could have a bearing. For example, proclivities toward creativity and felt pressure on work have received attention elsewhere (Amabile et al. 1996). In addition, whereas the present study was conducted at an individual level of analysis, organisational climate can be studied at group (e.g., Anderson and West 1998; Cohen et al. 1996) and organisational (Denison 1996) levels. A logical extension of the present study is to test its findings in multinationals from other countries in China and in relation to multinational subsidiaries in other countries. A particularly worthwhile effort might be to flip the present study on its head by comparing employees in Chinese-owned versus American-owned companies in the U.S.

Managerial implications

The findings from this study suggest that managers looking to encourage innovation in multinational subsidiaries can look toward components such as rewards, team participation, empowerment, and knowledge transfer as potential aids. At the same time, they need to be particularly sensitive to the countervailing influences of country culture and organisational climate on perceptions and behaviour. Although employee perceptions may be difficult to access, we would argue that company policies and practices have direct bearing on them by setting the context within which employees function.

One implication for executives is to note that employees hired from a company based in one country into a company based in another need to be acclimatised to the approach taken in their

new company. For example, a manager from a Chinese-owned company hired by an American subsidiary in China is likely to bring assumptions about influencing behaviour based on what worked well in his or her previous job. These assumptions may be incorrect.

Many multinationals, particularly American, seek to implement consistent policies and practices in their facilities around the world (Begley and Boyd 2003). Findings here imply that this effort may have some effect. Differences were found between Chinese employees in the Chinese- versus American-owned companies in the sample. Caution is advisable. First, the results need support from further studies. Second, the present study did not assess features such as employee morale, turnover, job satisfaction, or job performance which might be profoundly adversely affected by policies that run counter to cultural norms.

At the governmental level, if supported by further research, results from the present study would argue for careful consideration of any policy initiatives, since they may affect some companies differently than others. Policies considered particularly friendly by one group of companies may be regarded as just the opposite by another group. For example, tax policies that favour group versus individual bonus schemes in China may be well received by Chinese companies but not American ones, where individual empowerment may be the preferred practice.

Conclusion

Every culture has advantages and disadvantages for important organisational phenomena such as knowledge transfer and innovation, whether that culture is national, organisational, or subunit in nature, particularly when translated into the more proximal impact of organisational climate. The challenge is to determine how to maximize the advantages of each while minimizing the disadvantages. Such determinations could make cross-cultural combinations potent forms of competitive advantage. The fit of any given culture with managerial and motivational practices is bound to be imperfect. Multinational subsidiaries are increasingly being regarded as generating "third cultures" (Hui and Graen 1997), that is, hybrid versions of their home and host country cultures. If the resulting hybrid can use policies and practices that maximise the synergies from both, the possibility then opens up to combine the best features from each base culture to build organisations that outperform those from either one.

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