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How top management team diversity fosters organizational ambidexterity

The role of social capital among top executives

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Abstract

Purpose – Premised on the information-processing perspective, this paper attempts to examine whether diverse top management team can simultaneously pursue contradictory innovations.

Design/methodology/approach – The paper is based on a questionnaire survey and analysis of a sample of 113 firms in China.

Findings – Team heterogeneity has an ambiguous nature which may not only facilitate building paradoxical mental models or cognitive frames, but also harm the exchange of information and integration of differential knowledge within top management teams. Therefore, the paper argues that the most important issue in this research field is to address the dilemma and to find the governance mechanism to effectively manage the dual impact of team diversity on attaining organizational ambidexterity. The findings show that the social capital among top executives, including connectedness, trust and shared vision, can moderate the link between team diversity and organizational ambidexterity.

Originality/value – The paper suggests that building social capital among top executives may be a useful way or approach to information sharing and knowledge integrations within senior teams.

Keywords Team diversity, Social capital, Ambidexterity, Information processing, Top management team, Senior managers, Team performance, China

Paper type Research paper

1. Introduction

Over the past decade, one of the increasing themes of strategic management and organisational science is that successful organisations need to be ambidextrous, focusing on concurrently pursuing and balancing exploratory and exploitative innovation. Such organisations can explore new possibilities to achieve congruence with the changing business environment and simultaneously can exploit old certainties to secure efficiency benefits (Benner and Tushman, 2003). The link between organisational ambidexterity and firm performance was highlighted and empirically examined in relevant literature (Jansen *et al.*, 2006). Despite the contribution of previous studies (He and Wong, 2004; Katila and Ahuja, 2002; Yang and Li, 2011), few studies have expanded their scope to examine the drivers of achieving ambidexterity.

Because exploratory and exploitative innovation requires fundamentally different and inconsistent architectures and competencies, attaining organisational ambidexterity appears to be complex and difficult to achieve. Thus, engaging in high exploratory and exploitative innovation simultaneously is certain to create

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"paradoxical demands" and "paradoxical challenges" (Gilbert, 2005; Tushman and O'Reilly, 1996). Therefore, understanding what drive organisation to be ambidextrous has become a significant issue. A number of studies (Tushman and Rosenkopf, 1996) have begun to consider top management teams (TMTs) as vital to organisational reorientations. Smith and Tushman (2005) theoretically argued that the "design" or "composition" of a senior executive team is crucial for providing a diverse cognitive frame that may enables them to reconcile the paradoxical challenges. Building on an information-processing view, this paper proposes that a diverse top management team can facilitate attaining ambidexterity through the ability to handle large amounts of information and decision alternatives and deal with conflict and ambiguity. However, empirical evidence on whether a diverse senior team is beneficial for attaining organisational ambidexterity remains insufficient. Therefore, this paper builds on previous theoretical research to explain how the diversity or heterogeneity of a senior team influences and contributes to achieving ambidexterity.

Nevertheless, previous studies argued that a diverse senior team also leads to undesirable effects, the most prominent of which is communication and collaboration process deficiencies between senior team members (e.g. Auh and Menguc, 2005; Bunderson and Sutcliffe, 2002). That is, the diverse characteristics of TMTs may cause unexpected influences associated with inefficient information sharing and dissemination among TMT members. Examples of interpersonal conflict caused by greater group heterogeneity (e.g. Dahlin *et al.*, 2005) have shown that conflicts between group members may impede the sharing and dissemination of information among team members, resulting in solutions that are less than desirable. Based on this argument, this paper argues that instead of investigating the simple, direct relationship between TMT diversity and organisational ambidexterity, the variables that influence this link should be explored. Because determining the mechanisms that mitigate the undesirable effects of TMT diversity in achieving ambidexterity would improve our understanding of how senior teams can attain ambidexterity, such empirical evidence would be a valuable contribution to ambidexterity literature.

Building on these research gaps, this study contributes to the emergent dialogue on ambidexterity in two ways. First, our study addresses the ambiguous effects associated with TMT diversity to ambidexterity. From an information-processing perspective, previous studies (e.g. Haleblian and Finkelstein, 1993; Hambrick, 2007) have argued that one of the important responsibilities of top executives is processing information; the effective implementation of this task influences strategic choices and improves firm performance. Hence, this study builds on an information-processing perspective to present a brief discussion on how TMT diversity influences the achieving of organisational ambidexterity. Second, our study explores the moderating role of social capital among top executives on the ambiguous effects of senior team diversity. According to Nahapiet and Ghoshal (1998), social capital can be used as a key relational resource embedded in exchange relationships, which is likely to increase the level of knowledge exchanged between partners based on the quality of information sharing and the frequency of social interaction. Agreeing with social capital theory, this paper also employs an information-processing perspective to examine whether social capital among top executives can manage the ambiguous effects of TMT diversity for achieving organisational ambidexterity through leveraging intra-team information processing (see Figure 1).

2. Theoretical background and hypotheses

2.1 Organizational ambidexterity: a balance of both contradictory innovations

Researchers explicitly highlighted the need for firms to realize organisational ambidexterity, as the ability of firms to pursue and synchronize exploratory and exploitative innovation simultaneously, to obtain better financial performance and long-term survival (Benner and Tushman, 2003; Gibson and Birkinshaw, 2004; Raisch *et al.*, 2009). Synchronizing both contradictory innovations within a firm appears to be complex because they may require fundamentally different and inconsistent processes, systems, and competences (Benner and Tushman, 2003; Gibson and Birkinshaw, 2004). Exploratory innovations result from the search for new organisational routines and the discovery of new approaches to technologies, business, processes, and products. They focus on meeting the needs of emerging customers and markets through offering new designs, creating new products/services, and/or developing new channels of distribution. In contrast, exploitative innovations build on existing technologies, customers, and market knowledge, and reinforce existing skills and processes. They emphasise on meeting the needs of existing customers and markets through improving establishing designs, expanding existing products/services, and/or increasing the efficiency of existing distribution channels.

Increasingly, researchers have recognised that balance is the ideal outcome of ambidexterity, where balance dose not denote a mediocre split or bland compromise but truly excelling at both exploration and exploitation (e.g. Andriopoulos and Lewis, 2010; Gupta *et al.*, 2006). Based on the prior literature, prescribed approaches for realizing balance between both contradictory innovations typically advocate either structural ambidexterity or contextual ambidexterity (Simsek *et al.*, 2009). Structural ambidexterity stresses using structural mechanisms such as spatial separation or parallel structures to enable balance. For example, a firm could create structurally separate business units where some focus entirely on exploratory innovation and others focus entirely on exploitative innovation. But, this approach may engender isolation, engrain a preferred innovation mode, and impede coordination between varied efforts (Gibson and Birkinshaw, 2004); thus, it is typically better suited to larger firms.

Studies indicated that the second approach, contextual ambidexterity, focuses on utilizing behavioural and social means to balance exploration and exploitation. Relevant research has suggested that supportive social processes or context, culture, and interpersonal relations can promote a behavioural orientation towards thinking and acting ambidextrously throughout a firm (Gibson and Birkinshaw, 2004; Lubatkin *et al.*, 2006). Recent research increasingly recognises that this approach should place greater emphasis on the role of top executives than does structural ambidexterity (e.g. Raisch and Birkinshaw, 2008). Top executives make decisions regarding the

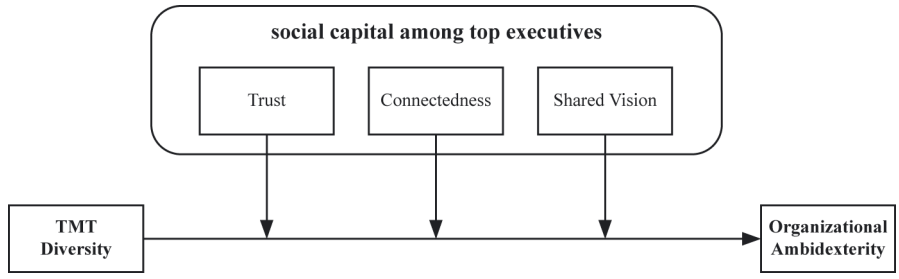

Figure 1.
Conceptual model

culture and resource allocation processes to enable the firm to explore and exploit simultaneously (Smith and Tushman, 2005; Gibson and Birkinshaw, 2004). This paper contributes to these arguments on attaining ambidexterity by examining the idea that senior team diversity and the interpersonal relationships among top executives facilitate the attainment of ambidexterity. This paper considers organisational ambidexterity as a behavioural orientation toward a combined capacity for both contradictory innovations that shapes individual and collective behaviours toward ambidexterity. This allows us to uncover how firms, whether larger firms or small- to medium-sized firms, are able to successfully pursue contradictory innovation streams simultaneously through the composition of their top management teams.

2.2 TMT diversity

Hambrick *et al.* (1996) based on the information-processing perspective suggests that TMT composition may form different cognitive frames that provide different mental models for strategic choices, thereby influencing firms' strategic decision making. Diversity in top management teams has received a great deal of attention in the relevant literature while diversity is beneficial in the strategic planning process and those of its outcomes that require substantial judgment and creative thinking (Bantel, 1993; Millikens and Martin, 1996). Prior research has certainly indicated that high task-related diversity of the top executives is more relevant for organisational outcomes than low task-related diversity because their work experiences and educations significantly affect their cognitive structures, knowledge, and competencies (Gunz and Jalland, 1996). Therefore, this paper follows prior research to focus on TMT task-related diversity. TMTs with task-related diversity have different types of knowledge and decision-making styles and a greater variety of professional perspectives. Such heterogeneity in perspectives and experiences further broadens the scope of collected information and encourages multiplicity in the solutions proposed for apparent and acute problems (Pitcher and Smith, 2001) to successfully address organisational dynamism and environmental complexity.

This paper assumes that TMT task-related diversity is beneficial to management processes that require substantial judgment and creative thinking, especially those regarding strategic contradictions. Diverse management teams may better manage simultaneous and conflicting demands compared to homogeneous TMTs because a greater combined set of skill, experience, and competency enables them to form paradoxical cognitive frames.

Task-related heterogeneity or diversity can be viewed as resources because they provide TMTs with multiple perspectives and increased information. Adopting an information-processing view, this paper argues that TMTs with diverse functional backgrounds, experience, and tenures can facilitate balancing exploration and exploitation because diverse TMTs have access to more information. TMTs with heterogeneity can directly influence the amount of information available to a team through the variety of team member perspectives, which enables access to a broader range of information sources and minimal information overlap (Dahlin *et al.*, 2005). Broader information without overlaps can create complex mental templates (Collins and Porras, 1997) that enable top executives to accept or embrace rather than avoid or deny the tensions from simultaneously pursuing exploration and exploitation. In addition, diverse TMTs that accept these tensions are likely to deeply process information associated with the tension between exploration and exploitation to identify potential synergies in the strategic contradictions. Thus, top executives can

overcome psychological and structural inertia (Geber *et al.*, 2010) to allocate the scarce resources between the strategic contradictions. Therefore, diverse TMTs have a greater variety of perspectives, which is associated with various skills, and non-redundant knowledge at their disposal, stimulating effective decision making regarding the division of resources between exploration and exploitation (Smith and Tushman, 2005).

Despite the advantages of TMT diversity for addressing contradictory information and knowledge processes, previous studies have indicated that diverse TMTs are accompanied by potential problems primarily driven by social categorisation (Tajfel, 1981; Turner, 1987) and interpersonal conflict (Amason, 1996; Knight *et al.*, 1999). Social categorisation theory proposes that individuals may categorise themselves and others into social groups, and then seek to bolster their in-group and derogate out-groups to enhance their self-construals. Because of social categorisation, heterogeneity may directly suppress information sharing by hindering effective communication and coordination between subgroups (Pelled *et al.*, 1999; Dahlin *et al.*, 2005). Members of teams with identifiable subgroups are less likely to accept ideas from other subgroups, thus reducing the effectiveness of using paradoxical frames to manage strategic contradictions. In addition, members focused on subgroup membership prevent a consensus on exploring one perspective for a shared vision, limiting acceptance of the tension between strategic contradictions. Previous studies (e.g. Knight *et al.*, 1999) have argued that interpersonal conflict is likely to occur in heterogeneous teams, which interferes with the teams' ability to share information and work together effectively. Consistent with previous research (cf. Millikens and Martin, 1996; Stewart and Johnson, 2009), this paper argues that team task-related heterogeneity is both an advantage and a disadvantage, and that some potentials of heterogeneity may benefit the forming of paradoxical cognitive frames, whereas others may hinder the sharing of information and acceptance of paradoxical challenges. Therefore, this paper argues that social capital among top executives may play a pivotal role in leveraging team-level information processing through which to attenuate the undesirable effect associated with TMT task-related diversity.

2.3 The role of social capital among top executives

This paper does not propose a hypothesis on the effect of TMT diversity on organisational ambidexterity as its central thesis. Instead, this paper predicts that social capital among top executives is likely to attenuate or exacerbate the potential disadvantages of team heterogeneity while enabling the full exploitation of team diversity for attaining ambidexterity. Social capital literature (Nahapiet and Ghoshal, 1998; Tasi and Ghoshal, 1998) posits that the relationship between different social entities can generate value through providing greater access to social resources, such as communication, coordination, and co-operation to enhance performance. This paper defines social capital among top executives as the interpersonal relationships of a top executive within a TMT, and the social resources embedded in those relationships. Adopting an information-processing perspective, this paper argues that social capital among top executives enables TMTs to benefit from allowing more open and honest sharing of information (Zaheer *et al.*, 1998) by creating an atmosphere of reciprocity and co-operation to better transfer information (Wu, 2008).

Using the structural, cognitive, and relational dimensions of social capital (Nahapiet and Ghoshal, 1998; Tasi and Ghoshal, 1998; Walker *et al.*, 1997), this paper explains that the intra-TMT social context, represented by the connection, trust, and shared

vision between team members, may influence the dual impacts of TMT diversity on simultaneously pursuing exploratory and exploitative innovations. The structural dimension of social capital reflects the pattern of connections or social interactions among exchange partners. An important aspect of this dimension is that actors can use their location in a social structure when interacting with other actors to obtain information or access specific resources (McFadyen and Cannella, 2004). The key benefit of this form of social capital is connectedness; actors can identify information and accessibility to knowledge sources within a social structure (Jaworski and Kohli, 1993). The relational dimension of social capital focuses on the role of goodwill trust, which acts as a governance mechanism for embedded relationships (Uzzi, 1996). A key benefit of trust is the ability to create obligations and expectations regarding the extent of co-operation among exchange partners. The cognitive dimension of social capital reflects the information benefits accrued from a shared code and paradigm between exchange partners. Within a social system, a shared vision determines the appropriate actions and facilitates understanding between actors.

Connectedness. This paper indicates that connectedness among top executives refers to formal or informal personal links between TMT members, which enabled access to other members' disparate experienced, knowledge, and backgrounds. Adopting an information-processing view, connectedness among top executives creates channels for information and knowledge to flow between TMT members. Through sharing and exchanging information, such channels enhance top executives' mutual adjustment and efforts to participate in problem solving (Heide and Miner, 1992). Therefore, close communication between top executives enables them to incorporate different perspectives to form paradoxical frames for allocating resources to both strategic contradictions. When communication channels are present, content-related disagreements regarding the resource allocation to both strategic contradictions enables top executives to recognise their different interpretations, understand the need to reconcile these differences, and identify mutually beneficial solutions to overcome psychological and structural inertia. Additionally, connectedness can facilitate frequent and close communication among top executives, which enables members or subgroups to increase their familiarity with each other, encourages the consideration of different ideas, and develops a common identity for top executives (De Dreu *et al.*, 2000; Uzzi, 1996). These arguments suggest that when top executives engage in close social interaction, TMTs have a greater ability to settle interpersonal conflicts and harness the different perspectives of subgroups or members, which increases the benefits of diversity for attaining ambidexterity.

Trust. In this study, trust refers to positive expectations regarding the quality of the relationships between TMT members (Mishira, 1996; Tasi and Ghoshal, 1998), where a top executive believes that other TMT members behave beneficially and not opportunistically. Although the various experiences, perspectives, and functions of TMT diversity benefit the fostering of paradoxical cognitive frames, the benefits may be suppressed when TMT members do not allow more open and honest information sharing within the TMT (Zaheer *et al.*, 1998). Previous studies have documented that trust can not only facilitate knowledge flows and information sharing (Yli-Renko *et al.*, 2001), but can also mitigate the negative emotions or conflict within a group (Porter and Lilly, 1996). According to an information-processing perspective, when trusting relationships develop within a TMT, top executives are encouraged to share and exchange information and knowledge by increasing their disclosure of knowledge and providing others access to their knowledge. On the other hand, previous studies (c.f Dyer

and Chu, 2003) have argued that trust among exchange partners is valuable as a moral control mechanism that minimizes interpersonal conflicts and other negative emotions (Ghoshal and Moran, 1996) and facilitates safe and minimally opportunistic exchange conditions. A heterogeneous team with trusting relationships can reduce the impact of self-construals caused by social categorisation and the tension from emotional conflicts that hinder effective communication, coordination, and collaboration. This study is based on the preceding arguments that TMT diversity can facilitate organisational ambidexterity through higher levels of trust within the TMT.

TMT's shared vision. This paper indicates that the shared vision of a TMT, which embodies the collective goals and aspirations of senior team members, can act as a bonding mechanism by enabling different senior executives to integrate resources (Larwood *et al.*, 1995; Tasi and Ghoshal, 1998). Several studies have shown that a shared set of goals and values can provide a common language platform, which eliminates the misunderstandings in member communication and increases opportunities for exchanging ideas and resources freely. Based on an information-processing perspective, building a common communication platform among senior team members enables them to share information, exchange their different perspectives, and incorporate opposing views more effectively. Because top executives acknowledge a shared vision by which they identify, obtain, and combine diverse perspectives on the effects of exploration and exploitation (Simons *et al.*, 1999), they are willing to consider and address the challenges of allocating resources to balance strategic contradictions. In addition, previous studies (Portes and Sensenbrenner, 1993) have indicated that a shared vision contributes to a collective understanding that can ameliorate the potential negative effects of TMT heterogeneity, such as interpersonal conflicts and social categorisation.

As mentioned previously, this paper proposes that social capital among top executives moderates the relationship between TMT diversity and organisational ambidexterity. Therefore, this study proposes the following hypothesis:

H1. When the connectedness among top executives, trust relationship within the TMT, and the shared vision of a TMT are higher than when they are low, TMT diversity has positive effects on building organizational ambidexterity

3. Research methods

3.1 Sample and data collection

Our study drew our sample from a mailing list of 1,500 Shenzhen manufacturing firms in China that we obtained from a located consulting firm. Randomisation was obtained by selecting every third firm form the list. Out study contacted the CEO of each firm by the located consulting firm to solicit its participation in our study, and then a total of 134 firms agreed to participate in this study. After excluding incomplete survey, surveys from the firm that had less than 25 employees, and the second questionnaire surveys that had less than a 50 per cent intrateam response, our study had usable questionnaires from 113 firm's CEO's and their top management team members, for a response rate of 26.8 per cent. The average age of firm was 11.3 years (SD = 6.3 years). Of the participating firms 19.5 per cent were in information technology, 20.4 per cent in telecommunications, 19.5 per cent in electronics, 15.0 per cent in biotechnology, 17.7 per cent in new materials, and 8 per cent in other areas. On average, they had 470.64 employees (SD = 267.78) and US$ 12 million in sales. The senior team members had a mean of 7.87 members per firm (ranged from six to nine individuals). To test the

non-response bias, the effective respondents were compared with the non-participating firms with regards to firm size, industry, and sales. The result of ANOVA indicated that there were no significant differences between the two groups.

In this study, the main independent and the dependent variables were separately measured and were collected through multiple respondents including CEO and top management team members to eliminate the potential concerns associated with single informant bias and common method bias. The first survey questionnaire was designed for the CEO and collected data on exploratory innovation, exploitative innovation, environmental dynamism, and environmental competitiveness; whereas the second survey questionnaire was designed for senior team members and collected data on trust, connectedness, TMT-level shared vision, exploratory innovation, and exploitative innovation. In most emerging economies, on-site interview approach is critical for ensuring better response rate and quality of the data collected (Hoskisson *et al.*, 2000). This paper use onsite interview approach in which a trained interviewer scheduled appointments, presented CEO and senior team members with the first and second survey questionnaire respectively and collected the questionnaire on completion. In the second survey, the consensus approach was used to rate for questionnaire item from senior team members. They were asked to deliberately assign a single rating based on consensus among those informants. And then, each interview for first survey questionnaire which lasted an average of 50 minutes was conducted with the CEO or the executive director of each firm, whereas each interview for second survey questionnaire which lasted an average of 80 minutes was conducted with two or three team members.

3.2 Measures, reliability, and validity of constructs

We present the measures for the independent, dependent, and control variables in Appendix (see Table AI). All multi-item variables were measured using a seven-point scale.

Based on previous research, this study combines firm-level exploratory innovation and firm-level exploitative innovation to measure organisational ambidexterity. First, based on the findings of Jansen *et al.* (2006), this paper measures firm-level exploratory innovation using a six-item scale ($\alpha = 0.88$), which captures the extent to which firms depart from existing knowledge and pursue radical innovations for emerging customers or markets. The six-item scale was also used to measure firm-level exploitative innovation ($\alpha = 0.89$), which tapped the extent to which firms build on existing knowledge and pursue incremental innovations to meet the demands of existing customers or markets.

Second, because our analysis focuses on the company, based on previous studies (Gupta *et al.*, 2006), this paper presumes that firm-level exploratory innovation and exploitative innovation are orthogonal. Hence, this study uses exploratory factor analysis to confirm the discriminant validity of the exploratory and exploitative innovation measurements. The results show that 12 items loaded cleanly on the expected factors, without significant cross-loadings. In addition, the results of confirmatory factor analysis also provided evidence of the discriminant validity of two types of innovations, which show that the chi-square for the constrained model was significantly greater than that for the unconstrained model. Finally, because numerous studies have presented diverse approaches to measure organisational ambidexterity, including multiplying, subtracting, and adding, our paper follows the suggestions of Lubatkin *et al.* (2006) to confirm the most comprehensible approach for combining firm-level exploratory

innovation and exploitative innovation. Based on the procedures recommended by Edwards (1994), the additive model was superior to the other two approaches, which indicates that the *F*-test has no significant loss of information compared to the unconstrained model (exploratory and exploitative innovation as separate independent variables). Because the results were consistent with those of Lubatkin *et al.* (2006) and Jansen *et al.* (2009), this study measures organisational ambidexterity by adding the scores of firm-level exploratory and exploitative innovations.

Our study measured TMT diversity with a five-item composite measure, which prior research has indicated that composite indicators of team heterogeneity constructs are good predictors of team outcomes (Campion *et al.*, 1993; van Knippenberg and Schippers, 2007). The scale ($\alpha = 0.77$) asked respondents to assess the degree of diversity or heterogeneity on expertise, background, experience, complementary skills, and education. This paper collected data for TMT integration mechanism through multiple top management team members per firm. Our study measured senior team shared vision with a five-item scale ($\alpha = 0.82$) that tapped the extent to which senior teams have collective goals and shared aspirations. The four-item scale ($\alpha = 0.73$) measured senior team's connectedness that reflected the extent to which top executives were networked to other senior team members in their team. Out study measured trust with four items ($\alpha = 0.73$) that refers to the extent to which the TMT believed that members performed their jobs skillfully, carefully, reliably, and professionally in the strategy planning and implementing.

This paper controlled for several variables. Prior research (Alexiev *et al.*, 2010) has indicated that larger firms may have slack resource to but lack flexibility to pursue exploratory and exploitative activities simultaneously. Therefore, our study used firm size, measured by the natural logarithm of the number of full-time employees, to control for greater complexity and internal inertia in larger firms in strategy implementing. In addition, firm age were measured by the natural logarithm of the number of years from funding to account for the fact that incumbent firms may be more internal inertia which may inclined to pursue exploitative activities and yet exploratory activities. Our study controlled for senior team size because it may affect the heterogeneity of senior team and also influence the dynamics in strategy implementing processes. Because environmental dynamism and environmental competitiveness are likely to obsolete current firm competencies, and then may trigger senior teams to develop entirely new ones (Day, 1994), our study included environmental dynamism and competitiveness to control the effect of environmental change on achieving organisational ambidexterity. Finally, since prior studies (He and Wong, 2004) have showed the industry effects on pursuing exploratory and exploitative innovations, this study used five dummy variables to measure industry effects.

Our study constructed an integrated confirmatory factory analysis to test convergent and discriminant validity for research variables. First, the results indicated that each measure loaded significantly on the expected constructs, which demonstrates convergent validity. Together, the factor loadings and model fit indexes ($\chi^2/\mathrm{df} = 1.14$, RMR = 0.04, IFI = 0.94, CFI = 0.94, and RMSEA = 0.04) presented in Table I suggest that the model fit is acceptable. Table I reveals that the diagonal elements representing the square roots of the average variance extracted (AVE) for each of the constructs is greater than the off-diagonal elements, which satisfies the criterion of discriminant validity (Fornell and Larcker, 1981). In addition, based on the recommendation suggested by Bagozzi *et al.* (1991), we also examine the chi-square difference test for all the constructs in pairs to check whether a single-factor model fit

Variables	Mean	SD	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Ambidexterity	9.31	0.99	–													
Top management team diversity	4.75	0.53	0.20**	0.62												
Connectedness	4.87	0.50	0.09	−0.04	0.64											
Trust	4.43	0.67	0.13	0.01	−0.07	0.82										
Senior team shared vision	4.75	0.54	0.15	−0.11	0.05	0.19**	0.70									
Environmental dynamism	4.88	0.49	0.03	0.16	−0.11	−0.03	−0.05	0.63								
Environmental competitiveness	4.43	0.66	−0.02	−0.30*	0.03	0.04	0.07	−0.07	0.75							
Firm age (log)	2.25	0.63	−0.19**	−0.04	−0.21*	−0.15*	−0.08	−0.09	−0.14	–						
Firm size (log)	5.91	0.81	−0.01	−0.10	0.04	0.24*	0.13	0.01	−0.07	−0.05	–					
Senior team size (Information technology	7.87	2.34	−0.05	0.03	0.00	−0.19**	0.03	−0.16**	0.09	0.22*	−0.09	–				
Telecommunications	0.15	0.36	−0.01	0.06	0.08	−0.05	−0.19**	0.01	−0.09	0.05	0.05	−0.02	–			
Electronics	0.20	0.40	−0.11	0.13	−0.14	−0.01	−0.06	0.15	−0.01	−0.04	0.04	−0.02	−0.2*	–		
Biotechnology	0.19	0.40	0.18**	−0.09	0.01	0.09	−0.05	−0.04	0.23*	0.01	−0.07	−0.08	−0.21*	−0.25*	–	
New materials	0.19	0.40	0.13	−0.10	0.08	−0.13	0.22*	−0.01	−0.10	−0.07	0.02	0.05	−0.21*	−0.25*	−0.24*	–
Composite reliability (CR)	0.18	0.38	−0.12	−0.06	−0.06	0.10	−0.03	−0.07	0.00	0.10	−0.12	0.03	−0.20*	−0.23*	−0.23*	−0.23*
			–	0.76	0.74	0.89	0.82	0.76	0.84	–	–	–	–	–	–	–

Notes: The diagonal elements are square roots of the AVE. *significant at 0.01 level (two tailed); **significant at 0.05 level (two tailed)

Table I.
Correlation matrix and descriptive statistics of measures

the data better than a two factor model. The results showed that all single-factor models were significantly greater than the chi-square for the unconstrained two factor models, also indicating discriminant validity. Finally, the constructs' previously reported alpha and the composite reliabilities (CRs) presented in Table I indicate that each exceeded the accepted reliability threshold of 0.70. Table I presents the correlations and descriptive statistics of the constructs.

4. Analysis and results

Using regression analysis, this paper captures the link between senior team diversity on organisational ambidexterity, and tests the moderating effects of social capital among top executives. In addition, this paper mean-centred these moderators before creating the interaction to reduce any collinearity between the main and the interaction effects (Aiken and West, 1991). Table II contains the results.

4.1 The moderating effects of senior team's connectedness

Model A in Table II tests the effects of the control variables on organisational ambidexterity. Adding the independent variables (TMT diversity and connectedness) in Model B1 contributed 4 per cent ($\Delta F = 3.18, p < 0.05$) more than the variance explained by the control variables. The addition of the interaction terms in Model B2, which resulted in an increase in R^2 of 8 per cent ($\Delta F = 5.90, p < 0.01$). *H1a* is supported because the product of TMT diversity and senior team's connectedness is positively related to organisational ambidexterity ($b = 0.21, p < 0.05$). Also, Model B2 shows that senior team's connectedness has no direct effect on organisational ambidexterity. It appears that senior team's connectedness has a full moderating effect on ambidexterity. Drawing on Aiken and West (1991) approaches, I conducted simple slope tests, and then, plotted the interactions. Figure 2 shows that when senior team's connectedness is high, the positive relationship between TMT diversity and organisational ambidexterity (simple slope: $b = 0.29, t = 2.22, p < 0.05$) is stronger than when it is low (simple slope: $b = 0.06, t = 0.41$, n.s.).

4.2 The moderating effects of senior team's trust

Adding the independent variables (TMT diversity and trust) in Model C1 contributed 6 per cent ($\Delta F = 4.01, p < 0.05$) more than the variance explained by the control variables. The addition of the interaction terms in Model C2, which resulted in an increase in R^2 of 11 per cent ($\Delta F = 6.18, p < 0.05$). The interaction term for TMT diversity and is positively related to organisational ambidexterity ($b = 0.23, p < 0.001$), in support of *H1b*. Figure 3 shows that the relationship between TMT diversity and organisational ambidexterity is stronger when senior team's trust is high (simple slope: $b = 0.52, t = 4.37, p < 0.001$) than when it is low (simple slope: $b = -0.07, t = -0.52$, n.s.). Model C2 also appears that senior team's trust has a full moderating effect on ambidexterity, which senior team's trust has no direct effect.

4.3 The moderating effects of senior team's shared vision

Adding the independent variables (TMT diversity and senior team's shared vision) in Model D1 contributed 7 per cent ($\Delta F = 4.86, p < 0.01$) more than the variance explained by the control variables. The addition of the interaction terms in Model 3, which resulted in an increase in R^2 of 12 per cent ($\Delta F = 5.36, p < 0.05$). *H1c* is supported because the product of TMT diversity and senior team's shared vision is positively related to

Table II.
Results of hierarchical regression analysis of interaction effect on ambidexterity

Variable	Model A	Model B1	Model B2	Model C1	Model C2	Model D1	Model D2
Control variable							
Firm age	−0.19†	−0.16	−0.16	0.16	−0.15	−0.17[a]	−0.15
Firm size	−0.02	0.02	0.00	−0.02	−0.03	−0.00	−03
Top management team size	0.02	0.00	0.02	0.02	0.03	−0.00	−0.00
Information technology	0.14	0.16	0.18	0.16	0.19	0.21	0.21
Telecommunications	0.08	0.09	0.14	0.09	0.13	0.12	0.10
Electronics	0.34*	0.37*	0.40*	0.35*	0.38*	0.40*	0.41**
Biotechnology	0.25	0.30†	0.35*	0.31*	0.37*	0.30[a]	0.29[a]
New materials	0.08	0.13	0.15	0.10	0.15	0.15	0.14
Environmental dynamism	0.01	−0.01	0.02	−0.01	−0.02	−0.01	0.03
Environmental competitiveness	−0.09	−0.01	−0.01	−0.01	−0.04	−0.02	−0.03
Independent variable							
Top management team diversity		0.25*	0.23*	0.24*	0.26**	0.26*	0.22*
Connectedness		0.04	0.05				
Trust				0.13	0.13		
TMT's shared vision						0.18[a]	0.19*
Interactions							
Top management team diversity ×							
Connectedness			0.21*				
Trust					0.23*		
TMT's shared vision							0.21*
Adjusted R^2	0.07	0.11	0.19	0.13	0.24	0.14	0.26
Δ adjusted R^2		0.04*	0.08**	0.06*	0.11*	0.07*	0.12*

Notes: Standardized regression coefficients are reported. †$p < 0.1$, *$p < 0.05$, **$p < 0.01$, ***$p < 0.001$

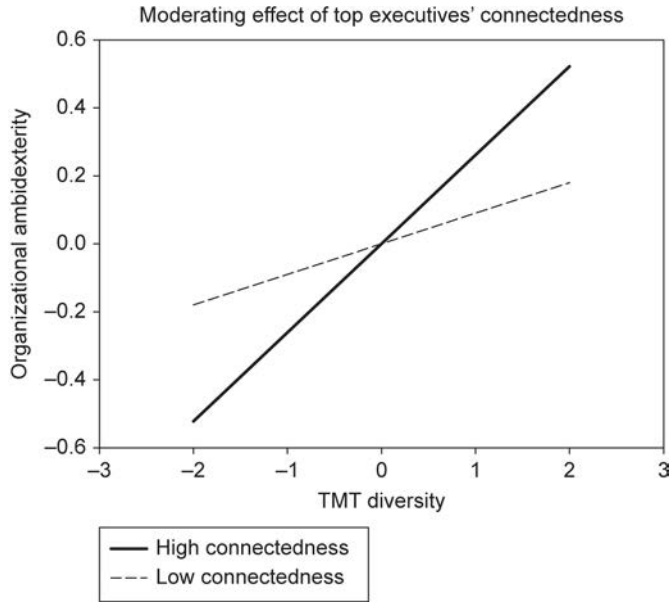

Figure 2.
The moderating effect of top executives' connectedness

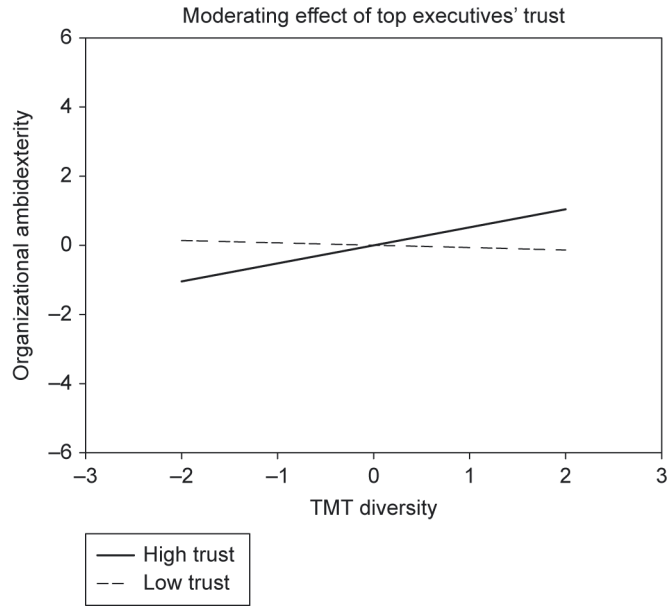

Figure 3.
The moderating effect of top executives' trust

organisational ambidexterity ($b = 0.21, p < 0.05$), in support of *H1c*. Figure 4 shows that when senior team's shared vision is high, the positive relationship between TMT diversity and organisational ambidexterity (simple slope: $b = 0.37, t = 3.13, p < 0.01$) is stronger than when it is low (simple slope: $b = 0.02, t = 0.16$, n.s.).

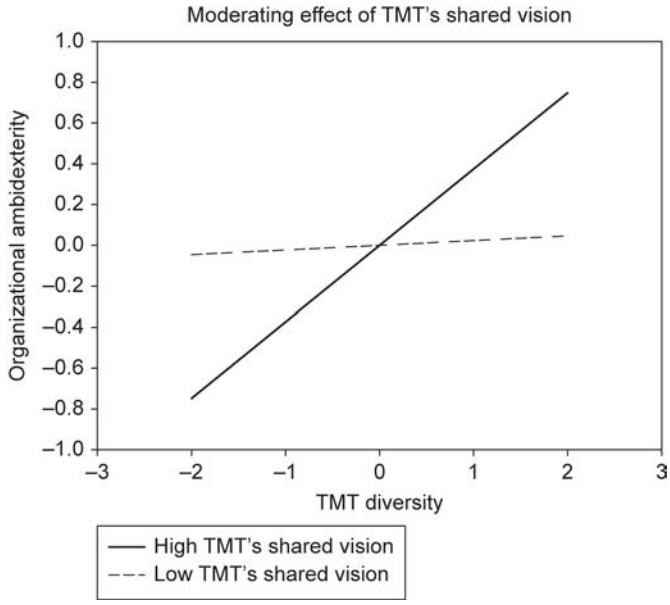

Figure 4.
The moderating effect of TMT's shared vision

5. Discussion and conclusion

Recent studies (Smith and Tushman, 2005) suggest that the composition of a top management team plays a crucial role in effectively managing contradictions to balance exploration and exploitation. However, few if any studies have explicitly modelled the effect of TMT characteristics on attaining organisational ambidexterity. Based on an information-processing perspective, this study argues that diverse senior teams can effectively manage contradictions by creating paradoxical cognition rooted in managerial frames and processes that recognise and embrace contradiction. However, previous studies on diversity (e.g. Auh and Menguc, 2005) argued that the heterogeneity of top management teams may increase undesirable effects by impeding the sharing and dissemination of information between team members. This study investigated the governance mechanism that facilitates a diverse senior team's engagement in paradoxical cognitive processes that affect organisational ambidexterity. In this contribution, this paper focuses on a previously neglected aspect by showing that social capital among top executives affects the link between TMT diversity and organisational ambidexterity. Based on an information-processing perspective, this study argued that the social capital among top executive can facilitate the intra-team information processing by which to promote the benefits of TMT diversity for achieving organisational ambidexterity.

The results show that, with lower social capital among top executives, TMT diversity is not significantly related to organisational ambidexterity (as connectedness is low, $\beta = 0.06, p > 0.05$; as trust is low, $\beta = -0.07, p > 0.05$; as shared vision is low, $\beta = -0.07, p > 0.05$). This finding confirms that overlooking the governance mechanisms, which can attenuate or exacerbate the potential disadvantages of team heterogeneity and exploit the advantages of team diversity on various cognitive frames and mental models, would result in misleading and ambiguous conclusions on the

contributions of TMT diversity for achieving organisational ambidexterity. Considering the moderating effects in line with our model, we found that higher social capital among top executives indicates that TMT diversity is positively related with attaining ambidexterity. These findings suggest that diverse senior teams forming paradoxical cognitive frames can benefit from the social capital among top executives. Regarding the social capital among top executives as a governance mechanism of information processing can also enhance social capital theory by explaining its valuable effects on facilitating information sharing and exchange within a top management team and efficient communication between senior team members.

These findings are significant because they further support the two perspectives. First, TMT task-related heterogeneity, as a double-edged sword for addressing the paradoxical challenges of pursuing both contradictory innovations, may not only promote the building of valuable mental frames but also hinder information sharing and exchange (e.g. Auh and Menguc, 2005; Bunderson and Sutcliffe, 2002; Talke *et al.*, 2010). Second, the social capital among top executives is a valuable resource and a group governance mechanism that can facilitate the acquisition and exchange of different information, enabling top management teams to embrace and manage strategic contradictions when attaining organisational ambidexterity. The findings also enhance literature on the attributes of senior teams in achieving organisational ambidexterity in two dimensions. First, contrary to previous research that focused on the positive aspects of heterogeneous or diverse top management teams (Smith and Tushman, 2005), this paper argued that TMT diversity has ambiguous effects for achieving ambidexterity when considering an information-processing perspective (Wu, 2008). Second, though previous studies examined the direct effects of senior team attributes on organisational ambidexterity (Jansen *et al.*, 2008; Carmeli and Halevi, 2009), this paper responded to the gap through social capital theory with an information-processing perspective. By providing empirical support of the effects of social capital among top executives, this paper verifies that social capital among top executives contributes indirectly to high organisational ambidexterity by enhancing the effectiveness of TMT task-related diversity.

Regarding the moderating role of social capital among top executives, this study contributes to previous studies on the importance of informal links among top executives for attaining ambidexterity (Lubatkin *et al.*, 2006). First, the effect of TMT task-related diversity on organisational ambidexterity is moderated entirely by goodwill trust between TMT members. Because trusting relationships encourage team members to openly share information and discuss conflicting goals and tasks (Tasi and Ghoshal, 1998), this context is more likely to mitigate the negative emotions and behaviours (interpersonal conflicts or opportunism) within a TMT rather than directly resolve the strategic contradictions caused by implementing spatially exploratory and exploitative activities simultaneously. Based on our finding that the connectedness of a senior team fully moderates the link between TMT diversity and organisational ambidexterity, connectedness may contribute to establishing a conducive context for generating information and knowledge flows among various members, rather than directly achieving ambidexterity. This finding is also consistent with that of Hambrick *et al.* (2008), namely, that senior team members require informal methods of integration when facing significant differences and high interdependency. Third, in contrast, the shared vision of a TMT is not only capable of moderating the relationship between TMT diversity and ambidexterity, but also directly achieving ambidexterity. For achieving ambidexterity, the shared vision of a TMT provides a common language

platform for team members to overcome the adverse effects of divergent goals and conflicting perspectives on implementing strategic contradictions based on collective goals (Jansen *et al.*, 2008), and indirectly increases opportunities for team members to exchange ideas or resources freely to form critical paradoxical cognitive frames. Through the enhanced explanation and empirical assessment of these diversity and governance mechanisms, this paper increases the clarity and understanding of how top executives can effectively manage strategic contradictions to achieve ambidexterity.

This study also presents important implications for managerial practice. First, the results suggest that firms must ensure task-related diversity within TMTs to facilitate the division of resources between exploratory and exploitative innovations and make balanced strategic decisions for ambidexterity. From a practical viewpoint, however, ensuring TMT diversity may be difficult to implement. Many studies have empirically found that TMTs in several countries are strikingly homogeneous (e.g. Campbell and Minguez-Vera, 2008; Hambrick, 2007). Accordingly, this study encourages selection and promotion policies that favour heterogeneity in TMTs. When attempting to set policies for TMT task-related diversity, organisations must carefully reconsider predominant perceptions of ideal TMT candidate profiles such as males, economists, or older persons, which may impede the policies. Thus, organisations must ensure that sufficient diversity exists within the team when filling management positions. Second, to attaining ambidexterity, top executives should understand that their internal social relationships affect the effectiveness of TMT task-related diversity through leverage their capacity of intra-team information processing. The results suggest that a greater effective balance of exploratory and exploitative innovations requires considering facilitating trust and connectedness among top managers and building their shared vision.

5.1 Limitations and future research

This study has several limitations that must be considered when interpreting the findings. The first and major limitation of this study is that top management team diversity is measured using job- or task-related heterogeneity measures that do not include all the different components or sub-dimensions. Future studies should examine this issue to explore the distinct dimensions of top management team diversity further, which may have different influences on achieving organisational ambidexterity. Previous research identified several different dimensions of top management team diversity, such as task-oriented diversity versus relationship-oriented diversity, or surface- and deep-level diversity (Harrison *et al.*, 2002). Second, causal relationships cannot be inferred by the results reported in this study. Further research could adopt a longitudinal design to clarify these links. Third, the generalizability of our findings is limited because the sample was obtained from a single high-technology development zone in China. Finally, common method bias in self-reported questionnaires may result in potential problems and cause concerns. In our study, however, the manner in which we separately collected data for the independent, dependent, and moderating variables from multiple respondents has been used to eliminate the possibility of such potential a bias. In addition, the results of the Harman one-factor method showed that common method bias may not be a serious problem (Menon *et al.*, 1999) because the first factor accounted for only 11.3 per cent of the variance.

The study indicates other fruitful lines of future studies. First, because our study examined TMT diversity as task-related heterogeneity, future research that uses the variety of demonstrated sources of heterogeneity may help explain the increased

variance of their effects on organisational ambidexterity. Previous research found that non-job-related heterogeneity may hinder the effectiveness of strategic changes in firm performance (Naranjo-Gil *et al.*, 2008). Hence, our study conducted various additional analyses. This paper measured non-job-related heterogeneity using a formative construct of age and gender. Similarly, we used a hierarchical regression analysis to test the effect of non-job-related heterogeneity on organisational ambidexterity. The results showed that non-job-related heterogeneity is significantly negatively related to organisational ambidexterity ($b = -0.26, p < 0.001$), and indicated no significant interactive effects between non-job-related heterogeneity and social capital among top executives, including those of connectedness, trust, and shared vision. In addition, future studies may also consider the role of the CEO or leadership. Because a number of studies have investigated the effects of CEO-TMT interaction (Cao *et al.*, 2010) and transformational leadership (Jansen *et al.*, 2008) on senior team dynamics and achieving ambidexterity, future research should examine the role of the CEO or top leaders on the effective management of the double nature of team diversity to achieve ambidexterity. Furthermore, because our study only address the moderating role of social capital among top executive, it may also have mediating effects on the link between TMT diversity and organisational ambidexterity. Future research can examine the mediation view to explain the variance in how top executives attaining organisational ambidexterity and manage strategic contradictions further, which also response to Hambrick's (2007) call that mediating factors should been devoted much attention in future TMT research.

5.2 Conclusion

In conclusion, this study challenges researchers and managers to adopt a more sophisticated assessment of how the composition of top management teams affects organisational ambidexterity. By delineating the dual nature of a senior team's diversity and by showing the moderating effect of social capital among top executives, we believe that our study explains how an ambidextrous organisation can be achieved more systematically through the effort of top executives, and provides a more comprehensive account of the complex processes senior team members use to distribute the firm's resources between exploratory innovations and exploitative innovations effectively.

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Appendix

Construct and source	Operational measure	SFL[a]	*t*-value
Connectedness (Jaworski and Kohli, 1993)	To what extent does each of the following statements describe your team		
	1. In our team, there is ample opportunity for informal "hall talk" among TMT members	0.66	6.72
	2. In this team, TMT members from different departments fell comfortable calling each other when the need arises	0.67	6.76
	3. People around here are quite accessible to each other	0.50	4.87
	4. In this team, it is easy to talk with virtually anyone you need to, regardless of rank or position	0.73	7.45
Trust (Atuahene-Gima and Murray, 2007)	TMT members could not be counted on to fulfill their responsibilities in a reliable manner	0.81	9.90
	TMT members did not approach their jobs in a professional manner	0.81	9.99
	TMT members approached their jobs carelessly	0.78	9.51
	TMT members performed their jobs less than skilfully	0.87	11.01
Exploratory innovation (Jansen *et al.*, 2006)	Over the last three years, to what extent has your firm		
	1. Our organization accepts demands that go beyond existing products and services	0.72	8.48
	2. We invent new products and services	0.71	8.27
	3. We experiment with new product and services in our local market	0.68	7.87
	4. We commercialize products and services that are completely new to our organization	0.83	10.45
	5. We frequently utilize new opportunities in new markets	0.76	9.08
	6. Our organization regularly uses new distribution channels	0.79	9.66
Exploitative innovation (Jansen *et al.*, 2006)	Over the last three years, to what extent has your firm		
	1. We frequently refine the provision of existing products and services	0.75	9.03
	2. We regularly implement small adaptations to existing products and services	0.74	8.86
	3. We introduce improved, but existing products and services for out local market	0.83	10.29
	4. We improve our provision's efficiency of products and services	0.76	9.13
	5. We increase economies of scales in existing markets	0.72	8.45
	6. Our organization expands services for existing clients	0.72	8.38
TMT shared vision (Tasi and Ghoshal, 1998; Sinkula *et al.*, 1997)	To what extent does each of the following statements describe your team		
	1. There is commonality of purpose in my senior team	0.74	8.29
	2. There is total agreement on our organizational vision	0.65	7.06
	3. All senior team members are committed to the goals of this organization	0.70	7.78
	4. People are enthusiastic about the collective goals and mission of the whole organization	0.70	7.77
	5. Our senior team lacks a clearly defined collective vision (R)	0.70	7.72

(*continued*)

Table AI. Measures and confirmatory factor analysis results

Construct and source	Operational measure	SFL[a]	*t*-value
Environmental competitiveness (Yang and Li, 2011)	Indicated the extent to which your principal industry has experienced the following in the last three years		
	1. Competition in our local market is intense	0.77	9.00
	2. Our firm has relatively strong competitors	0.71	8.09
	3. Competition in our local market is extremely high	0.75	8.63
	4. Price competition is a hallmark of our local market	0.78	9.12
Environmental dynamism (Yang and Li, 2011)	Rate the degree to which each of these statements describes the market and competitive environment during the last three year		
	1. The actions of local and foreign competitors in ours major markets were changing quite rapidly	0.50	5.05
	2. Technological changes in our industry were rapid and unpredictable	0.78	8.42
	3. The market competitive conditions were highly unpredictable	0.57	5.90
	4. Customers' product preferences changed quite rapidly	0.68	7.23
	5. Changes in customers' needs were quite unpredictable	0.58	5.95

Table AI.

About the author
Ci-Rong Li has received the PhD of the Department of Business Administration of National Dong Hwa University in Taiwan. Currently, he is the Strategic Renewal Lab's research fellow of Entrepreneurship and Business Management Research Centre (E&BMRC). His current research interests focus on market orientation, product quality and innovativeness, competitive strategy and product development team. Ci-Rong Li can be contacted at: cirongli@gmail.com

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