Developing Organizational Agility through IT Capability and KM Capability: The Moderating Effects of Organizational Climate

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DEVELOPING ORGANIZATIONAL AGILITY THROUGH IT CAPABILITY AND KM CAPABILITY: THE MODERATING EFFECTS OF ORGANIZATIONAL CLIMATE

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Abstract

According to the hierarchical framework of organizational capabilities and the capability embeddedness view in dynamic capability theory, this study investigates how lower-order capabilities (i.e. knowledge management capability and information technology capability) influence higher-order capability (i.e. organizational agility), which finally lead to superior firm performance. Meanwhile, the moderating effect of organizational climate (including affiliation, innovativeness, and fairness) is investigated as well. The results of a survey of 131 firms indicate that both KM capability and IT capability have a positive effect on agility, and agility has a positive effect on firm performance. Organizational climate plays different kinds of moderating roles. Specifically, the three dimensions of climate have a positive influence on the relationship between IT capability and agility. However, for the relationship between KM capability and agility, only fairness has a negative moderating effect.

Implications and suggestions for future research are provided.

Keywords: organizational agility, IT capability, KM capability, organizational climate.
1 \ INTRODUCTION

In today’s volatile market, market competition is causing both demand and supply to fluctuate more rapidly, widely, and frequently than they used to (Lee 2004). Under this condition, firms ought to be agile and be able to sense and respond to market changes quickly and smoothly to maintain their competitiveness (Lee 2004; Weill et al. 2002). Organizational agility, which emphasizes rapid and innovative response to market change, thus is becoming a critical weapon to respond to market uncertainties and opportunities (Chung et al. 2012; Dunlop-Hinkler et al. 2011; Zelbst et al. 2011). This agility reflects a firm-wide capability to deal with unexpected changes via rapid and innovative responses (Lu & Ramamurthy 2011). To develop this capability, firms have invested many resources in information technology (Lu & Ramamurthy 2011). This raises an interesting question: How does IT enhance organizational agility (Lu & Ramamurthy 2011; Roberts & Grover 2012)?

In the existing IS literature, although some scholars have asserted that IT can enable agility, other researchers have “also noted that IT may hinder and sometimes even impede organizational agility” (Lu & Ramamurthy 2011 p.932). These mixed observations indicate that it is still necessary and critical to explore the development of agility, especially considering the role of IT in the developing process. Specifically, the agility literature has argued that rapid response and innovative response are fundamental to organizational agility. In this view, IT capability has been identified as a critical ability to influence the rapidness of firm, namely the speed of sense and response to market changes by the high velocity of information transfer (Lu & Ramamurthy 2011). However, scholars have indicated that IT capability normally requires complementary organizational capability so that it can be deployed and then play a role. In this view, scholars increasingly realized that knowledge management (KM) capability may act as such a complementary capability, which is an essential ability to promote innovation of a firm (Darroch 2005; Kamhawi 2012). In this view, considering both IT capability and KM capability as antecedents of agility may help understand how IT impacts organizational agility.

On the other hand, by only exploring the capability antecedents of agility, it is hard to explicate why the levels of agility differ among organizations with the same capabilities. Lu and Ramamurthy (2011) tried to explain this phenomenon by investigating the moderating effects of IT spending on the relationship between IT capability and agility. Meanwhile, some research indicates that contextual factors, such as organizational climate, may leverage the development of agility. For example, the view of dynamic capability have proposed that a favorable context in organization may play a critical role in the formation of organizational capabilities (Grewal & Slotegraaf 2007). However, few researchers have empirically investigated the potential role of organizational contexts in the development of organizational capabilities, especially the development of agility (e.g. Fink & Neumann 2007; Tallon & Pinsonneault 2011).

In the current research, we adopted the dynamic capability perspective to develop the research framework. Scholars have proposed that the dynamic capability perspective includes the view of a hierarchy of capabilities and the view of capability embeddedness (Grewal & Slotegraaf 2007; Rai et al. 2006; Wu et al. 2006). Specifically, this research intends to investigate two issues based on these two views. First, from the view of a hierarchy of capabilities (Grewal & Slotegraaf 2007), we try to explore how and to what extent do KM capability and IT capability affect organizational agility. The hierarchy of capabilities view claims that a firm’s lower-order capabilities could be integrated to generate higher-order capabilities, thereby enhancing organizational performance. Accordingly, we define IT capability and KM capability as lower-order capabilities (Cepeda & Vera 2007; Schreyogg & Kliesch-Eberl 2007), and propose that these two capabilities would enhance the higher-order capabilities of organizational agility, which could improve firm performance directly (Dunlop-Hinkler et al. 2011; Salvato & Rerup 2011; Schreyogg & Kliesch-Eberl 2007).

Second, based on the view of capability embeddedness, we aim to investigate how and to what extent organizational climate leverages the development of agility. The capability embeddedness view argues that an organizational capability should be contextually entrenched within the structural,
social, and cultural aspects of the firm. Thus, we propose that organizational climate, which includes affiliation, innovativeness and fairness, could moderate the impacts of IT capability and KM capability on organizational agility.

2 THEORETICAL BACKGROUND AND HYPOTHESES

2.1 The dynamic capability perspective

The dynamic capability perspective has been widely utilized in the business strategy literature (Cepeda & Vera 2007; Wu 2007). This theory suggests that the success of a firm relies on its ability to integrate, build, and reconfigure internal and external competencies to achieve new forms of competitive advantage (Teece et al. 1997; Tsai 2001). Scholars further proposed that the view of a hierarchy of capabilities and the view of capability embeddedness could constitute the basic views of the dynamic capability perspective (Grewal & Slotegraaf 2007; Rai et al. 2006; Wu et al. 2006).

According to the view of a hierarchy of capabilities, various kinds of resources (Teece et al. 1997) and specialized knowledge (Grant 1996) could be combined and integrated to generate lower-order capabilities. These lower-order capabilities are combined to generate higher-order capabilities, which can enhance the performance or competitive advantage of organizations (Grewal & Slotegraaf 2007). Some researchers claim that the lower-order capabilities contain operational routines and higher-order ones contain dynamic capabilities (Salvato & Rerup 2011; Schreyogg & Kliesch-Eberl 2007). In the existing literature, organizational agility has been treated as one type of dynamic capability, which refers to a higher-order capability (Agarwal & Selen 2009; Dunlop-Hinkler et al. 2011). It is widely acknowledged that as a higher-order capability, organizational agility not only can enhance performance directly (Dunlop-Hinkler et al. 2011; Tallon & Pinsonneault 2011; Wu et al. 2006; Zelbst et al. 2011), but also it can be developed as a consequence of other capabilities, such as KM capability (Gold et al. 2001) and IT capability (Lu & Ramamurthy 2011; Sambamurthy et al. 2003; Tallon & Pinsonneault 2011). KM capability and IT capability normally reflect the operational routines and resources to support daily work, which featured them as the lower-order capabilities. Specifically, according to knowledge-based view, specialized knowledge owned by individuals is one of the most important resources of an organization (Alavi & Leidner 2001; Grant 1996). As a managerial approach, KM provided various process to utilize these intangible resources, serving as a fundamental capability to develop higher-order ones in capability architecture (Grant 1996). On the other hand, IT capability is regarded as lower-order capability in existing literature, in order to promote higher-order capabilities such as customer service (Chen & Tsou 2012), new product development (Court et al. 1997; Durmusoglu & Barczak 2011), and agility (Lu & Ramamurthy 2011; Tallon 2008). Furthermore, KM capability is increasingly associated with innovation (du Plessis 2007; Lundvall & Nielsen 2007), which constitutes one aspect of agility. IT capability is widely considered as a provider to accelerate information process and transfer, making rapid responses (Bharadwaj 2000; Lu & Ramamurthy 2011), which is another feature of agility.

Further, the view of capability embeddedness suggested that a firm’s capability should be contextually entrenched within the structural, social, and cultural aspects of the firm (Grewal & Slotegraaf 2007). It is claimed that capability embeddedness can create barriers to prevent imitation by other competitors due to the isolating mechanism (Rumelt 1984). This could explain why firms with similar or even the same capabilities may achieve different levels of performance or competitive advantage. To be specific, firms cannot reach a similar performance as target firms by merely imitating the developing mode of the benchmark firm. Further, this view indicates that capability embeddedness plays a positive role in forming capabilities and achieving better performance (Grewal & Slotegraaf 2007).

Based on the above two views, we developed the conceptual model as shown in Figure 1.
Organizational agility is defined as a firm-wide capability to deal with changes that often arise unexpectedly in business environments via rapid and innovative responses that exploit changes as opportunities to grow and prosper (Lu & Ramamurthy 2011). This definition clarifies that rapid response and innovative response reflect the property of agility. Rapidness concentrates on time, which is a basic requirement of agility in both response and implementation. Innovativeness emphasizes the quality of the content of a response. Innovative response is broadly identified, which contains not only new products or services but also new systems or processes (Gloet & Terziowski 2004). Only by effective and precise responses (e.g. strategic orientation, product development, and decision making) to market change, can agility be achieved.

According to Lu and Ramamurthy (2011), organizational agility could be categorized into market capitalizing agility and operational adjustment agility. These two kinds of agility focus on different perspectives of organization. Market capitalizing agility is the ability to quickly improve products or services according to the change of customers’ preferences. It is an externally-focused agility, achieved by continuously monitoring the market status and trends and communicating with customers (Sambamurthy et al. 2003). This kind of agility is also an intellectual one. After obtaining raw material from outside, the original data should be converted into meaningful information which can help senior executives to make decisions about the improvement of products or services. In contrast, operational adjustment agility is internally-focused. It refers to the ability to cope with market or demand changes physically and rapidly with its internal business processes (Lu & Ramamurthy 2011). This agility concentrates on the integration of operational processes to provide a support to the innovative ideas, putting the ideas and decisions into implementations.

Organizational agility has been defined as a dynamic capability, a higher-order capability, which can enhance the performance over a relatively long time frame by effectively responding to customers’ demands. Specifically, as a dynamic capability, organizational agility facilitates integrating and
assembling resources, such as assets, knowledge, and relationships (Sambamurthy et al. 2003). For example, operational adjustment agility can integrate internal resources quickly to adjust the modification of a product or service scheme, and then improve the productivity. Market capitalizing agility can precisely and rapidly sense the change of market and transfer this signal to a firm. This ability would help executives to make the right decision to produce or service the right things which can be sold out smoothly. Indeed, prior researchers have proposed that organizational agility has a positive effect on performance (Tallon & Pinsonneault 2011; Wu et al. 2006; Zelbst et al. 2011). Accordingly, we hypothesize that.

H1a: Operational adjustment agility is positively associated with firm performance.

H1b: Market capitalizing agility is positively associated with firm performance.

2.3 Antecedents of organizational agility

2.3.1 Knowledge management capability

KM capability refers to the degree to which the firm mobilizes and deploys knowledge resources across functional boundaries (Chuang 2004; Liao et al. 2011). The literature has defined a firm’s ability to manage product knowledge, customer knowledge, and managerial knowledge as the basic dimensions of KM capability (Tanriverdi 2005; Tanriverdi & Venkatraman 2005). Specifically, product knowledge refers to research and the knowledge of development and operations by which the firm develops and produces its products and services; customer knowledge refers to the needs, preferences, and buying behaviors of customers and markets of the firm; managerial knowledge refers to the knowledge required for governing the firm (Tanriverdi 2005).

According to Alavi and Leidner (2001), knowledge is personalized, and possessed by individuals or groups. The value of knowledge can be maximized only through being expressed to others in an interpretable way. It is acknowledged that firm’s mechanism to integrate knowledge is critical for organization capability rather than the extent of specialist knowledge (Grant 1996). Based on above, we can propose that, as a mechanism to mobilize and deploy knowledge resources, KM capability plays an important role in forming higher-order capabilities.

Agility is promoted by KM capability mainly through improving innovative responds. Specifically, with a favorable level of knowledge management, tacit knowledge processed by individual can be converted to explicit knowledge in order to transfer (Nonaka 1994). In addition, Collaboration within firm can be achieved through continuously communication and knowledge sharing, which can enhance the distribution of know-how knowledge (du Plessis 2007). Further, KM capability ensures that the firm has the ability to integrate the transferred knowledge with the existing knowledge within the firm (Gold et al. 2001), and then apply such knowledge to improve the managerial practices or behavioral norms (Tanriverdi 2005). As a consequence, innovative responds are emerged to cope with market turbulence.

In this view, through effectively managing the three kinds of knowledge would provide foundation to cope with volatile market. For example, creating and transferring customer knowledge helps firms detect changes of customers’ preferences and tastes, acknowledging their demands. After receiving the information of demands, firms could take actions to develop new products or services, or modify operational processes to adjust the market. These actions would be facilitated through integrating production knowledge to ensure their efficiency. Finally, the overall process of reacting to change needs the leveraging of managerial knowledge, not only to support governing firms, but also to make appropriate changes at the organizational level to fit the business environment.

H2a: KM capability is positively associated with operational adjustment agility.

H2b: KM capability is positively associated with market capitalizing agility.
2.3.2 Information technology capability

IT capability is a kind of organizational ability to support organizational activities and integrate other resources and activities of organizations by disposing IT resources (Bharadwaj 2000; Lee et al. 1995; Lu & Ramamurthy 2011). It serves as a fundamental lower-order capability to support the process of sensing and responding to market change, as well as taking responsibility for synergizing resources among different parts of the organization. IT capability is also considered to create “response lag”, which is the time it takes competitors to respond aggressively enough to erode the competitive advantage (Piccoli & Ives 2005). That is to say, IT capability serves as a barrier to imitation.

Based on prior research (Tippins & Sohi 2003; Yoo 2011), we categorized IT capability into IT objects, IT knowledge, and IT operations. IT objects refer to computer-based hardware, software, and support personnel (Tippins & Sohi 2003), which contain both IT infrastructure and the deployment of human resource relative to IT. IT knowledge is defined as the extent to which a firm possesses a body of technical knowledge about objects such as computer based systems (Tippins & Sohi 2003). IT operations are conceptualized as the extent to which a firm utilizes IT to manage market and customer information (Tippins & Sohi 2003). Lu and Ramamurthy (2011) identified IT capability as a support for not only business processes but also business strategies, involving its attribution of opportunity orientation (i.e. IT proactive stance). However, we narrow the scope of IT capability, taking this notion as an IT-centered one, reflecting the extent of “(utilizing) IT to manage information within the firm” (Tippins & Sohi 2003 p.748). In this sense, IT capability plays a more fundamental and supportive role in our study.

The literature indicates that a firm with superior IT capability can constantly monitor a market and find out signals of changes immediately (Lu & Ramamurthy 2011). Specifically, IT objects provide a basic support to agility with both IT infrastructure and IT personnel. For example, a well-designed IT infrastructure with a favorable degree of integration can create synergy among different departments (Bharadwaj 2000), which can speed up information transfer and reduce misunderstanding of information induced in the process of transfer. IT personnel make the infrastructure run smoothly and serve as a transformation mechanism that converts inputs of physical components into outputs of IT services (Fink & Neumann 2007). Meanwhile, IT knowledge facilitates agility through technical knowledge. Technical knowledge, which is codified into words as guidebooks, manuals, templates, procedures, archives and literature, allows firms to communicate with a standardized vocabulary. This helps avoid possible misunderstandings and saves the time required for effective communication. Further, IT operations help improve agility through applying IT services into business processes more functionally and efficiently. For example, when applying IT into firms, it could provide an opportunity to reengineer business processes (Gunasekaran & Nath 1997), which can enhance the alignment between IT and business processes. This would facilitate the restructuring of both existing business practices and existing IT work processes to ensure that IT can be used to enhance the efficiency of firm (Bharadwaj et al. 1999).

H3a: IT capability is positively associated with operational adjustment agility.

H3b: IT capability is positively associated with market capitalizing agility.

2.4 The moderating effect of organizational climate

Organizational climate is a shared perception of what the organization is like in terms of practices, policies, procedures, routines and rewards (Bowen & Ostroff 2004). We take organizational climate as moderator based on the view of capability embeddedness (Grewal & Slotegraaf 2007), which alleges that a favorable context should be provided in order to promote capability building and performance enhancing. Prior research has explored the effect of organizational climate on different aspects of firms, such as knowledge sharing (Bock et al. 2005), knowledge management (Chen & Huang 2007; Janz & Prasarnphanich 2003), decision making (Chen & Lin 2004), ability to change (Lehman et al. 2002), and innovation (Chen et al. 2010; Wu & Shi 2008). Accordingly, climate has been considered as an important element of organizational contexts.
According to the research of Bock et al. (2005), we identify fairness, innovativeness and affiliation as the basic dimensions of organizational climate. Affiliation is about the sense of identity of an organization and the perception of a sense of togetherness of members. With a climate of affiliation, informal communications and interactions can be performed among members. These activities can enhance the transferring and sharing of various kinds of knowledge (Chen & Huang 2007), making the fruit of KM more applicable for staff to fast responding and sensitive monitoring. Therefore, a climate of affiliation can positively moderate the relationship between KM capability and agility. Meanwhile, the informal channels created by intimate relationship and spirit of mutual help also promote the sharing of know-how knowledge, which is critical to enhancing the manipulation of information systems or other IT equipment. With a good use of IT capability, the gap between business and IT can be narrowed. So, affiliation may positively moderate the relationship between IT capability and agility.

An innovative organization is enthusiastic about creation. They are more tolerant of failure, encouraging the raising of new ideas through communication (Bock et al. 2005; Chen & Huang 2007). In such organizations, members are encouraged to apply novel ideas into practice, which may produce a new method to react to market change, or to reorganize the internal productive procedure. As a consequence, a climate of innovativeness can positively moderate the relationship between KM capability and agility. When it comes to IT activities, members are not satisfied merely to manipulate IT equipment under a climate of innovativeness. They are more willing to explore a way to integrate IT practice to business operations. Moreover, this climate also enhances the learning orientation of staff (Samad 2010). By mutual learning, the application of IT practice will be improved. This will enhance the relationship between IT capability and agility.

A climate of fairness refers to an individual’s perception of equality. This kind of feeling includes not only the equality of status but also the perceptual equality of rewards (Bock et al. 2005). This climate provides a form of security that encourages staff to share their knowledge and skills. It is also conducive to the transfer of KM fruit to executives smoothly to deal with market changes. So fairness may strengthen the relationship between KM capability and agility. As to the IT side, skilled employees are willing to teach new employees as long as their positions and rewards are guaranteed. With more skilled staff, the positive association between IT capability and agility can be improved. Based on the arguments above, we raise the following hypotheses.

**H4a:** Organizational climate (characterized by affiliation, innovativeness and fairness) positively moderates the relationship between KM capability and operational adjustment agility.

**H4b:** Organizational climate (characterized by affiliation, innovativeness and fairness) positively moderates the relationship between KM capability and market capitalizing agility.

**H5a:** Organizational climate (characterized by affiliation, innovativeness and fairness) positively moderates the relationship between IT capability and operational adjustment agility.

**H5b:** Organizational climate (characterized by affiliation, innovativeness and fairness) positively moderates the relationship between IT capability and market capitalizing agility.

### 3 RESEARCH METHOD

#### 3.1 Sample and data collection

We designed a questionnaire survey to test our hypotheses. The survey is conducted in China because Chinese firms are playing an important role in the world market, and their ability is critical for a supply chain across the world. To obtain valid and reliable responses, we cooperated with a Chinese educational institution. This institution is well known for its executive training programs, including the provision of training courses in information systems, knowledge management and strategic management. From the institution, we obtained a sampling pool that included 236 firms that have information management and knowledge management initiatives.
Using senior executives as “key informants” as data source is a widely accepted approach in organizational studies (Paulraj et al. 2008). In the current study, we thus identified one senior executive from each firm to serve as a key informant. These executives are chosen based on the following reasons. First, these executives have received the training about information systems, knowledge management, and strategic management, which are essential to an understanding of the survey. Second, as senior managers, they have a comprehensive view of their firms to precisely answer the questions about various organizational capabilities. Finally, with their top positions in a firm, their perception of the organizational climate is accurate and not significantly subject to personal prejudice. Although selecting one respondent from each firm may not acquire the whole situation about a firm, this method is common among recent empirical studies such as those studying organizational capabilities (Kmieciak et al. 2012; Wong & Wong 2011; Zhang & Sarker 2008).

After distributing the questionnaires, we conducted follow-up phone calls and sent reminder emails to encourage response. We received 148 questionnaires, among which 17 were incomplete and were thus discarded. Finally, 131 valid questionnaires were used for the analysis, a response rate of approximately 55.5%. Following Armstrong and Overton (1977), we evaluated the non-response bias by comparing the first 25% of the respondents and the final 25% of the respondents on all variables using the chi-squares. The results indicate that no significant differences were found, suggesting that the non-response bias is not a critical issue in this study. Table 1 presents the demography of the samples.

<table>
<thead>
<tr>
<th>INDUSTRY</th>
<th>NUMBER OF EMPLOYEES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mechanical Equipment Manufacturing</td>
<td>Less than 100</td>
</tr>
<tr>
<td>Financial Industry</td>
<td>100-299</td>
</tr>
<tr>
<td>Wholesale and Retail Trade</td>
<td>300-499</td>
</tr>
<tr>
<td>IT Industry</td>
<td>500-999</td>
</tr>
<tr>
<td>Real Estate Industry</td>
<td>1000-1999</td>
</tr>
<tr>
<td>Construction Industry</td>
<td>More than 2000</td>
</tr>
<tr>
<td>Others</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>OWNERSHIP</th>
<th>FIRM HISTORY</th>
</tr>
</thead>
<tbody>
<tr>
<td>State-owned</td>
<td>1-5 Years</td>
</tr>
<tr>
<td>Privately Owned</td>
<td>6-10 Years</td>
</tr>
<tr>
<td>Foreign-controlled</td>
<td>11-25 Years</td>
</tr>
<tr>
<td>Sino-Foreign Joint Venture</td>
<td>26-50 Years</td>
</tr>
<tr>
<td>Others</td>
<td>More than 51 Years</td>
</tr>
</tbody>
</table>

Table 1. Sample demographic

3.2 Measures

We developed an English questionnaire first, and then translated it into Chinese by a team consisting of four researchers from different majors (e.g. Information Systems, English Translation, and Business Administration). Afterwards, a professional translator who doesn’t know anything about this study is hired to translate the Chinese questionnaire back to English. We found that this English version is similar to the original one without semantic discrepancy. In the questionnaire, all items were measured with 5-point Likert scales, ranging from “strongly disagree” to “strongly agree”.

In the current research, IT capability is defined as a formative construct with three reflective dimensions (i.e. IT objects, IT knowledge, and IT operations). These three dimensions were measured based on the scales adopted from Tippins and Sohi (2003). Meanwhile, we treated KM capability as a formative construct with three reflective dimensions (i.e., product, customer, and managerial KM
capability. These three dimensions were measured by four items adopted from Tanriverdi (2005) respectively. Operational adjustment agility and market capitalizing agility were measured by the items adopted from Lu and Ramamurthy (2011). Affiliation, innovativeness, and fairness, which reflect a firm’s organizational climate, were measured by 3 items adopted from Bock et al. (2005). Finally, we measured firm performance by testing the senior executives’ perceptions of their firm’s performance relative to their key competitors. 10 items were adopted from Wang and Wang (2012).

The current research further considered three control variables (i.e. industry, ownership, and firm size), which may impact organizational capability and performance. The industry type contains 18 industries involved in this research. The ownership type includes state-owned, privately owned, foreign-controlled, and joint venture. The number of full-time employees is considered as a representation of firm size.

4 ANALYSIS AND RESULTS

Given that all data were collected from a single source simultaneously, common method bias posed a threat to the validity of our research. In the current study, we conducted Harman’s post hoc single-factor analysis to examine for common method bias. If common method variance is a serious issue, a factor analysis would generate a single factor accounting for most of the variance (Podsakoff et al. 2003). An EFA of all indicators was conducted and the first extracted factor explained about 29 percent of the variance. This analysis indicated that common method bias is unlikely to be an issue in our data.

4.1 Measure validation

We evaluated the construct reliability, validity and unidimensionality of the resulting multi-item measurement scales. Specifically, we assessed the reliability of each construct using Cronbach’s Alpha and composite reliability as suggested by Fornell and Larcker (1981). As shown in Table 2, these values of most constructs were higher than the suggested threshold of 0.70, except the construct of innovativeness. Further, we tested the convergent validity by the items’ loadings and the Average Variance Extracted (AVE). The data in Table 2 indicated the loadings ranged from 0.533 to 0.935 at a significance level of 0.001. The AVE scores for constructs varied from 0.571 to 0.807, which were above the recommended benchmark of 0.500 (Fornell & Larcker 1981). Although the Cronbach’s Alpha value of innovativeness is less than 0.70, and the loading of Inn2 is below 0.60 (p < 0.001), we still keep this item to ensure the content validity. Furthermore, we tested discriminant validity by comparing the relationship between the correlations among the constructs and their square root of AVEs (Paulraj et al. 2008). As Table 3 shows, none of the correlations between constructs was higher than the square roots of the AVE, which meet the requirement of discriminant validity. Hence, we concluded that the measurement model possessed adequate convergent validity, discriminant validity, and reliability.

In Table 3, there are several inter-construct correlations higher than the benchmark of 0.60. To test the potential issue of multicollinearity, we analyzed the value of Variance Inflation Factor (VIF) and tolerance for each construct. The results showed that the highest VIF was 2.88 and the lowest tolerance value was 0.35. Given that VIF value was below 10, and the tolerance value was above 0.10 simultaneously (Kutner et al. 2004), multicollinearity did not appear to be a significant problem in our dataset.
### Table 2. Results of Confirmatory Factor Analysis (CFA).

<table>
<thead>
<tr>
<th>Items</th>
<th>Loading</th>
<th>Composite reliability</th>
<th>Cronbach's alpha</th>
<th>AVE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Product KM Capability</td>
<td>0.68-0.79</td>
<td>0.84</td>
<td>0.75</td>
<td>0.57</td>
</tr>
<tr>
<td>Customer KM Capability</td>
<td>0.74-0.78</td>
<td>0.85</td>
<td>0.75</td>
<td>0.58</td>
</tr>
<tr>
<td>Managerial KM Capability</td>
<td>0.71-0.85</td>
<td>0.86</td>
<td>0.78</td>
<td>0.60</td>
</tr>
<tr>
<td>IT Objects</td>
<td>0.60-0.90</td>
<td>0.88</td>
<td>0.81</td>
<td>0.64</td>
</tr>
<tr>
<td>IT Knowledge</td>
<td>0.85-0.94</td>
<td>0.94</td>
<td>0.92</td>
<td>0.81</td>
</tr>
<tr>
<td>IT Operations</td>
<td>0.75-0.85</td>
<td>0.92</td>
<td>0.90</td>
<td>0.67</td>
</tr>
<tr>
<td>Operational Adjustment Agility</td>
<td>0.72-0.86</td>
<td>0.90</td>
<td>0.86</td>
<td>0.64</td>
</tr>
<tr>
<td>Market Capitalizing Agility</td>
<td>0.85-0.90</td>
<td>0.91</td>
<td>0.86</td>
<td>0.78</td>
</tr>
<tr>
<td>Firm operational performance</td>
<td>0.78-0.84</td>
<td>0.92</td>
<td>0.89</td>
<td>0.65</td>
</tr>
<tr>
<td>Firm financial performance</td>
<td>0.86-0.87</td>
<td>0.92</td>
<td>0.89</td>
<td>0.74</td>
</tr>
<tr>
<td>Affiliation</td>
<td>0.75-0.90</td>
<td>0.88</td>
<td>0.80</td>
<td>0.72</td>
</tr>
<tr>
<td>Innovativeness</td>
<td>0.53-0.89</td>
<td>0.81</td>
<td>0.62</td>
<td>0.59</td>
</tr>
<tr>
<td>Fairness</td>
<td>0.80-0.86</td>
<td>0.88</td>
<td>0.79</td>
<td>0.70</td>
</tr>
</tbody>
</table>

Note: The diagonal elements are the square roots of AVEs.

### Table 3. Assessment of discriminant validity

<table>
<thead>
<tr>
<th>Mean SD</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
<th>11</th>
<th>12</th>
<th>13</th>
<th>14</th>
<th>15</th>
<th>16</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.Product KMC</td>
<td>3.66</td>
<td>0.74</td>
<td>0.76</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>2.Customer KMC</td>
<td>3.83</td>
<td>0.74</td>
<td>0.59</td>
<td>0.76</td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>3.Managerial KMC</td>
<td>3.90</td>
<td>0.74</td>
<td>0.62</td>
<td>0.61</td>
<td>0.78</td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>4.IT Objects</td>
<td>3.22</td>
<td>1.01</td>
<td>0.10</td>
<td>0.09</td>
<td>0.19</td>
<td>0.80</td>
<td></td>
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<td></td>
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</tr>
<tr>
<td>5.IT Knowledge</td>
<td>3.98</td>
<td>1.08</td>
<td>0.21</td>
<td>0.14</td>
<td>0.19</td>
<td>0.69</td>
<td>0.90</td>
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<td></td>
</tr>
<tr>
<td>6.IT Operations</td>
<td>3.43</td>
<td>0.91</td>
<td>0.30</td>
<td>0.34</td>
<td>0.33</td>
<td>0.45</td>
<td>0.44</td>
<td>0.82</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>7.Operational Adjustment Agility</td>
<td>0.76</td>
<td>0.75</td>
<td>0.26</td>
<td>0.35</td>
<td>0.43</td>
<td>0.13</td>
<td>0.35</td>
<td>0.38</td>
<td>0.80</td>
<td></td>
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</tr>
<tr>
<td>8.Industry</td>
<td>3.75</td>
<td>0.82</td>
<td>0.37</td>
<td>0.39</td>
<td>0.35</td>
<td>0.10</td>
<td>0.33</td>
<td>0.45</td>
<td>0.68</td>
<td>0.88</td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>9.Firm operational performance</td>
<td>3.70</td>
<td>0.76</td>
<td>0.32</td>
<td>0.27</td>
<td>0.42</td>
<td>0.21</td>
<td>0.36</td>
<td>0.39</td>
<td>0.65</td>
<td>0.61</td>
<td>0.81</td>
<td></td>
<td></td>
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<tr>
<td>10.Firm financial performance</td>
<td>3.50</td>
<td>0.76</td>
<td>0.34</td>
<td>0.27</td>
<td>0.31</td>
<td>0.29</td>
<td>0.41</td>
<td>0.36</td>
<td>0.40</td>
<td>0.55</td>
<td>0.66</td>
<td>0.86</td>
<td></td>
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<tr>
<td>11.Affiliation</td>
<td>3.66</td>
<td>0.68</td>
<td>0.28</td>
<td>0.28</td>
<td>0.33</td>
<td>0.26</td>
<td>0.37</td>
<td>0.27</td>
<td>0.48</td>
<td>0.41</td>
<td>0.48</td>
<td>0.42</td>
<td>0.85</td>
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<tr>
<td>12.Innovativeness</td>
<td>3.63</td>
<td>0.76</td>
<td>0.26</td>
<td>0.11</td>
<td>0.22</td>
<td>0.22</td>
<td>0.36</td>
<td>0.30</td>
<td>0.44</td>
<td>0.49</td>
<td>0.50</td>
<td>0.43</td>
<td>0.53</td>
<td>0.77</td>
<td></td>
<td></td>
</tr>
<tr>
<td>13.Fairness</td>
<td>3.55</td>
<td>0.81</td>
<td>0.34</td>
<td>0.34</td>
<td>0.40</td>
<td>0.21</td>
<td>0.34</td>
<td>0.30</td>
<td>0.48</td>
<td>0.52</td>
<td>0.58</td>
<td>0.49</td>
<td>0.56</td>
<td>0.47</td>
<td>0.84</td>
<td></td>
</tr>
<tr>
<td>14.Industry</td>
<td>NA</td>
<td>NA</td>
<td>0.05</td>
<td>-0.02</td>
<td>0.10</td>
<td>-0.16</td>
<td>-0.04</td>
<td>-0.01</td>
<td>0.12</td>
<td>0.11</td>
<td>0.14</td>
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<td>0.07</td>
<td>0.06</td>
<td>0.09</td>
<td>NA</td>
</tr>
<tr>
<td>15.Ownership</td>
<td>NA</td>
<td>NA</td>
<td>0.01</td>
<td>0.06</td>
<td>0.09</td>
<td>-0.07</td>
<td>0.02</td>
<td>0.07</td>
<td>0.07</td>
<td>0.06</td>
<td>-0.04</td>
<td>0.06</td>
<td>-0.04</td>
<td>-0.03</td>
<td>0.11</td>
<td>0.14</td>
</tr>
<tr>
<td>16.Firm Size</td>
<td>NA</td>
<td>NA</td>
<td>-0.01</td>
<td>0.03</td>
<td>-0.06</td>
<td>0.33</td>
<td>0.21</td>
<td>0.02</td>
<td>0.00</td>
<td>0.05</td>
<td>0.03</td>
<td>-0.01</td>
<td>0.05</td>
<td>-0.05</td>
<td>0.01</td>
<td>-0.06</td>
</tr>
</tbody>
</table>

Note: The diagonal elements are the square roots of AVEs.

### 4.2 Hypotheses testing

We chose PLS Graph to test our hypotheses. This analytical approach is an appropriate tool to examine the effects of formative constructs, and has a low requirement for sample size. Figure 2 indicates the weights of the dimensions of constructs, the \( R^2 \) of endogenous variables, and the structural path coefficients and their significance. In this study, the formative constructs were modeled as the multidimensional constructs consisting of their sub-constructs as indicators. According to Rai et al. (2006), the weights of the sub-constructs can act as the beta coefficients in a regression model. Our results presented that all the sub-constructs have significant weights. Further, the model explained 24.3 to 45.5 percent of the variances.
The results showed that all the control variables (i.e. industry, ownership, firm size) were not significant in impacting operational adjustment agility ($\beta = 0.128, 0.025, -0.049$ respectively), market capitalizing agility ($\beta = 0.107, 0.008, -0.102$ respectively), and performance ($\beta = 0.090, -0.047, 0.034$ respectively). Meanwhile, the results indicated that hypotheses H1a and H1b which demonstrated the relationship between operational adjustment agility (b = 0.161, p < 0.1), as well as on the relationship between IT capability and market capitalizing agility (b = 0.201, p < 0.01) were supported. Hypotheses H2a and H2b which demonstrated the relationship between KM capability and operational adjustment agility (b = 0.317, p < 0.001) and market capitalizing agility (b = 0.342, p < 0.001) were supported. Hypotheses H3a and H3b which demonstrated the relationship between IT capability and operational adjustment agility (b = 0.277, p < 0.001) and market capitalizing agility (b = 0.285, p < 0.001) were supported, either. In summary, all the hypotheses of main effects were well supported.

To test the moderating effects of organizational climate, we further conducted hierarchical regression analysis (Kutner et al. 2004). Following the analysis method suggested by Perrone et al. (2003), we examined two kinds of model separately. The results showed that all the three types of organizational climate could strengthen the impact of IT capability on organizational agility, namely operational adjustment and market capitalizing agility. Specifically, affiliation could strengthen the relationship between IT capability and operational adjustment agility ($b = 0.256, p < 0.01$), as well as on the relationship between IT capability and market capitalizing agility ($b = 0.201, p < 0.05$). Similarly, innovativeness could enhance the impact of IT capability on operational adjustment agility ($b = 0.242, p < 0.01$), as well as the impact of IT capability on market capitalizing agility ($b = 0.136, p < 0.1$) are testified. In addition, fairness could strengthen the relationship between IT capability and operational adjustment agility ($b = 0.161, p < 0.1$), as well as on the relationship between IT capability and market capitalizing agility ($b = 0.180, p < 0.05$). They demonstrated the veracity of hypotheses H5a and H5b respectively.

On the other hand, the results presented that both affiliation and innovativeness cannot moderate the relationship between KM capability and organizational agility significantly. Hypothesis H4a is not supported. However, we found that fairness could significantly weaken the relationship between KM capability and market capitalizing agility ($b = -0.146, p < 0.05$). It provided partial negative support to hypothesis H4b. Table 5 reports the results of our hypothesis testing.

Figure 2. PLS analysis of direct effects

To test the moderating effects of organizational climate, we further conducted hierarchical regression analysis (Kutner et al. 2004). Following the analysis method suggested by Perrone et al. (2003), we examined two kinds of model separately. The results showed that all the three types of organizational climate could strengthen the impact of IT capability on organizational agility, namely operational adjustment and market capitalizing agility. Specifically, affiliation could strengthen the relationship between IT capability and operational adjustment agility ($b = 0.256, p < 0.01$), as well as on the relationship between IT capability and market capitalizing agility ($b = 0.201, p < 0.05$). Similarly, innovativeness could enhance the impact of IT capability on operational adjustment agility ($b = 0.242, p < 0.01$), as well as the impact of IT capability on market capitalizing agility ($b = 0.136, p < 0.1$) are testified. In addition, fairness could strengthen the relationship between IT capability and operational adjustment agility ($b = 0.161, p < 0.1$), as well as on the relationship between IT capability and market capitalizing agility ($b = 0.180, p < 0.05$). They demonstrated the veracity of hypotheses H5a and H5b respectively.

On the other hand, the results presented that both affiliation and innovativeness cannot moderate the relationship between KM capability and organizational agility significantly. Hypothesis H4a is not supported. However, we found that fairness could significantly weaken the relationship between KM capability and market capitalizing agility ($b = -0.146, p < 0.05$). It provided partial negative support to hypothesis H4b. Table 5 reports the results of our hypothesis testing.
Table 4. Results for hierarchical regression analysis.

<table>
<thead>
<tr>
<th>Hypothesis</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>H1a Operational adjustment agility is positively associated with performance.</td>
<td>Supported</td>
</tr>
<tr>
<td>H1b Market capitalizing agility is positively associated with performance.</td>
<td>Supported</td>
</tr>
<tr>
<td>H2a KM capability is positively associated with operational adjustment agility.</td>
<td>Supported</td>
</tr>
<tr>
<td>H2b KM capability is positively associated with market capitalizing agility.</td>
<td>Supported</td>
</tr>
<tr>
<td>H3a IT capability is positively associated with operational adjustment agility.</td>
<td>Supported</td>
</tr>
<tr>
<td>H3b IT capability is positively associated with market capitalizing agility.</td>
<td>Supported</td>
</tr>
<tr>
<td>H4a Organizational climate (characterized by affiliation, innovativeness and fairness) positively moderates the relationship between KM capability and operational adjustment agility.</td>
<td>Not supported</td>
</tr>
<tr>
<td>H4b Organizational climate (characterized by affiliation, innovativeness and fairness) positively moderates the relationship between KM capability and market capitalizing agility.</td>
<td>Partly reversely supported</td>
</tr>
<tr>
<td>H5a Organizational climate (characterized by affiliation, innovativeness and fairness) positively moderates the relationship between IT capability and operational adjustment agility.</td>
<td>Supported</td>
</tr>
<tr>
<td>H5b Organizational climate (characterized by affiliation, innovativeness and fairness) positively moderates the relationship between IT capability and market capitalizing agility.</td>
<td>Supported</td>
</tr>
</tbody>
</table>

Table 5. Results of hypothesis testing

5 DISCUSSION

Our findings on the effects of IT capability, KM capability, agility, and performance are not only consistent with prior research, but also provide new empirical evidence to support the argument that lower-order capabilities can improve the development of higher-order capabilities and higher-order capabilities can enhance performance. Specifically, we showed that a firm’s lower-order capabilities, namely KM capability and IT capability, have a positive impact on agility. These findings are
consistent with previous research (Chung et al. 2012; Gallagher & Worrell 2008). Also, the results indicate that firm performance is positively influenced by agility, which is consistent with previous research, too (Lu & Ramamurthy 2011). Moreover, the impact of KM capability is stronger than IT capability. This may due to the rising status of intangible resources such as specific knowledge and innovations, which can lead to sustainable advantages hard to be imitated by others (Miranda et al. 2011).

In addition, our research has tested the moderating effect of organizational climate on the relationship between IT capability, KM capability and agility. The results showed that organizational climate characterized by affiliation, innovativeness, and fairness can positively affect the relationship between IT capability and organizational agility. This accords with the capabilities embeddedness view raised by Grewal and Slotegraaf (2007). As demonstrated before, IT capability is more concerned with the physical and technical side of factors, containing relatively little in the way of human factors compared to KM capability. A favorable climate brings human factors, which is needed to develop agility (Crocitto & Youssef 2003), into IT capability, enhancing the positive effect on agility as a consequence.

Our hypotheses of the moderating effect of organizational climate on the relationship between KM capability and agility are not supported. This may be because the outputs of KM capability are mostly well-shaped knowledge and innovations, which can be directly applied to production or operation in response to market change. In comparison, the outputs of IT capability are supportive functionalities, which need employees to manipulate to enhance the reaction speed, and the climate has a significant moderating effect. Furthermore, there exists an exception, the relationship between KM capability and market capitalizing agility is negatively moderated by the climate of fairness, which is the reverse of our hypothesis. It may be explained by the following reason. With a climate of fairness, employees may be willing to share knowledge with their colleagues and contribute to their firms (Li et al. 2010). As market knowledge is owned more widely than other kinds of knowledge by employees, it is probable that decision makers are confused with excess advice about market capitalizing, so that the agility of market capitalizing is decreased.

6 IMPLICATIONS AND LIMITATIONS

The present research enriches the discussion about organizational capability by focusing on organizational agility, which is considered as an important specific organizational capability. We take a view of hierarchical capability, considering organizational agility as higher-order capability which is influenced by lower-order ones, namely, KM capability and IT capability. Agility influences organizational performance as well. Indeed, researches exploring antecedents of agility out of the perspective of organizational capability are limited. Grewal and Slotegraaf (2007) urge researchers to find other capabilities which are critical to performance out of this theoretical framework. Our research is undertaken partly in response to their call. The findings further help extend the existing understanding on the role of IT capabilities in influencing agility.

In addition, the current research also takes capability embeddedness into consideration. We select a relatively important aspect of organizational context – organizational climate – as a representation of capability embeddedness in our study. This is another response to the call of Lu and Ramamurthy (2011), which suggests researchers to find other elements (e.g. culture, structure, process, or people interact) that influence agility. We suppose organizational climate may moderate the relationship between KM capability, IT capability, and organizational agility. According to the results, the moderating effects are significant when considering the relationship between IT capability and organizational agility. However, when it comes to the relationship between KM capability and organizational agility, the moderating effects become insignificant, except the negative moderating effect of fairness on the relationship between KM capability and market capitalizing agility. Although the moderating effects of climate are conditionally-based, the view of capability embeddedness can be testified to some extent.
Furthermore, the findings of this research provide implications for practitioners about building agility as well. To be specific, both IT capability and KM capability are important in fostering organizational agility. Although the impact of IT capability on agility is less than that of KM capability, the relationship between IT capability and agility can be positively moderated by organizational climate. Therefore, fostering a climate of affiliation, innovativeness and fairness is conducive to developing agility, despite a slightly negative moderating effect of fairness on the relationship of KM capability and market capitalizing agility.

This research has some limitations that should be identified and addressed in future research. First, the sample size of this study is 131, which may hardly represent the comprehensive situation of organizational capability in China. Although we have covered various industries to generalize our study, deeply probing into one specific industry may provide new ideas to this field. So, future studies can craft on sampling to make their research widely and deeply.

Second, when we get information of firms, we select only one senior executive as the respondent. As a consequence, the feedback may be partial. Even though senior executives know the condition of their firm, there still exist blind spots. In addition, since the measurements are objective and perceptual, being responded by one person a firm may be bias. Future study can consider obtaining twice as many responses per firm to raise the representativeness, as Lu and Ramamurthy (2011) suggested.

Third, capability has its lifecycle (Helfat & Peteraf 2003). Sometimes, when a capability is built, the effect on the firm takes time to happen. A cross-sectional research design can only reflect the situation of a firm at a specific period of time. However, the longitudinal and sustainable effects of capabilities cannot be explored by this kind of research. Longitudinal research is needed to further explore this theme, finding answers to questions such as when the capabilities take effect, could they lead to the sustainable performance, and what is their combined effect in the long term.

7 CONCLUSIONS

Agility is one of the organizational capabilities most discussed in recent years. There are many fruitful works done in this field. Our research is based on the view of hierarchical capability and capability embeddedness. According to prior research, we narrow the scope of lower-order capability to two specific capabilities: IT capability and KM capability. Meanwhile, we consider organizational climate as the moderator in the relationship between IT capability, KM capability and organizational agility based on capability embeddedness. Our results provide support for the views mentioned before as well as suggestions to practitioners. Both IT capability and KM capability are critical to agility in a favorable context, enhancing a firm’s performance. We hope our research can provide inspiration to the discussion of organizational agility and promote a more comprehensive and generalized view about this theme.

ACKNOWLEDGMENTS

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