

Information communication, organizational capability and new product development: an empirical study of Chinese firms

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Abstract This study focuses on how information acquisition and communication influence new product development through organizational capability. Our empirical results, based on sample data from 607 Chinese firms, show that external information acquisition has a positive effect on proactiveness capability and a negative effect on operation capability. In contrast, however, we find that internal information communication has a negative effect on proactiveness capability and a positive effect on operation capability. Finally, we find that proactiveness capability has a significant positive impact on operational capability and NPD. This research extends the literature on information communication, organizational capability, and NPD in general.

Keywords Information acquisition and communication · Organizational capability · New product development

JEL Classification O32

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1 Introduction

As the competitive environment has become increasingly global, more and more firms have realized the critical importance of new product development (NPD) in building and maintaining their core competences and competitive advantage. NPD is fast becoming a crucial factor in firms' performance and survival (Brown and Eisenhardt 1995). Because NPD is a knowledge-based activity that emphasizes organizational learning, many researchers have argued that information communication is important for NPD (Cooper and Kleinschmidt 1995; Yannis et al. 2004). They claim to find an implicit relationship between NPD and information communication, and they suggest that NPD can be improved through information communication and knowledge transfer.

But although much extant literature does highlight the important role of information communication in NPD, the findings have been inconsistent. Whereas many studies indicate that external information acquisition positively influences NPD (Gatignon and Xuereb 1997; Atuahene-Gima et al. 2005), others find that such external information acquisition, especially information about a firm's customers and competitors, actually leads to lower rather than higher NPD performance (Frishammar and Horte 2005; Trott 2001). Moreover, other researchers claim to have found no relationship at all between market information acquisition and NPD performance (Moorman 1995).

We believe that this ambiguity may arise for two reasons. First, previous research has focused narrowly on the direct impact of information communication on NPD and has neglected other factors, such as organizational capability, that may underlie them both. Second, the majority of studies on NPD have treated information communication only as a unidimensional construct, when in fact it is more complex. Thus, further investigation is needed to resolve these inconsistencies. We have therefore constructed a conceptual model which examines the relationships among information communication, organizational capability and NPD. We seek to contribute to the literature in this area in the following ways.

First, we extend the literature on NPD by investigating how information communication improves firms' NPD through organizational capability. This perspective is important because knowledge generated outside the firm is generally explicit, and it can become valuable for firms only after it has been internalized and translated into organizational capability (Nonaka 1994). For that reason, we expect that organization capability will mediate the relationship between information communication and NPD.

Second, we extend the literature on information communication by arguing that information communication is not unidimensional. Instead, a clear distinction should be made between external information acquisition and internal information communication, and the impacts of each of these two kinds of information communication capability must be studied separately. As Frishammar and Horte (2005) argue, gathering information from outside is important but not sufficient; sharing the acquired information across functional areas is also vital.

Third, existing research on these topics has been conducted mainly in Western countries, leaving the generalizability of the findings to other research settings, such as transitional economies, an open issue. Given China's increasing importance in the global economy and the significant growth of Chinese firms' NPD (Li and Atuahene-Gima 2001; Li et al. 2008), a focus on Chinese firms can contribute to a better understanding of the underlying theory.

The remainder of the paper proceeds as follows. In Sects. 2 and 3, we conduct a comprehensive review of information communication, organizational capability and NPD, and develop hypotheses concerning these relationships. Section 4 describes our research

methodology, including data collection, construct measurement, and safeguards against non-response bias. Our data analysis procedures, using structural equation modeling, are provided in Sect. 5. Section 6 presents the discussion and managerial implications of the findings, and we conclude with a discussion of limitations and suggestions for future research.

2 Theoretical background

2.1 Information communication and NPD

As competitive pressures increase, the importance of NPD for good long-term company results is now widely recognized and has been extensively reported in the literature (Lemon and Sahota 2004; Lee and Veloso 2008). For many firms, NPD is a potential source of competitive advantage and is a critical means by which organizational members diversify and adapt to evolving market and technical conditions (Brown and Eisenhardt 1995). By developing innovative products and bringing them to market ahead of competitors, firms can attain many benefits (Zhou 2006). It is especially important for firms in emerging countries such as China to be successful innovators, so that they can build a large market share and enjoy a sustainable competitive advantage (Robinson and Min 2002; Li et al. 2007). As the world's fastest-growing economy, China has attracted many foreign firms to enter and operate in its market. Therefore, developing proper new products has become increasingly significant for local firms, in order to survive the competition (Zhou et al. 2005; Li et al. 2008).

NPD is a knowledge-based activity that emphasizes organization learning and information communication (Kim and Atuahene-Gima 2010). Recent research shows that the whole process of NPD involves a lot of uncertainties, so a firm must collect and exploit market information and improve internal information exchange (Li et al. 2006). At the same time, NPD is a social-interaction process, which depends on the acquisition, communication and use of new knowledge (Damanpour 1991). Firms often do not have enough time or resources to internally develop the knowledge needed for NPD, because of the complexity of technological developments and increasing competitive pressures. So a common and frequently viable option in NPD is the acquisition of knowledge from outside sources. However, knowledge or information obtained from outside the firm is generally explicit, and it becomes useful for firms only after it can be internalized and translated into organizational capability (Nonaka and Takeuchi 1995). Thus, firms acquire new information from outside sources and incorporate it into their knowledge base for the development of organization capability (Eisenhardt and Martin 2000). Grant (1996) also argues that externally acquired information helps firms to advance their product research capability.

At the same time, external information acquisition and internal information communication are different things, and their impacts on NPD are different (Ottum and Moore 1997). In the past, however, they have generally, with the notable exception of Frishammar and Horte (2005), been studied separately rather than within an integrated framework. It is necessary to put the two forms of information communication into an integrative framework in order to examine their relative roles in the process of NPD.

2.2 Organizational capability and NPD

NPD is a very complex process. To make it a success, a firm must have not only the capability to precisely identify consumer needs and potential market opportunities, but also

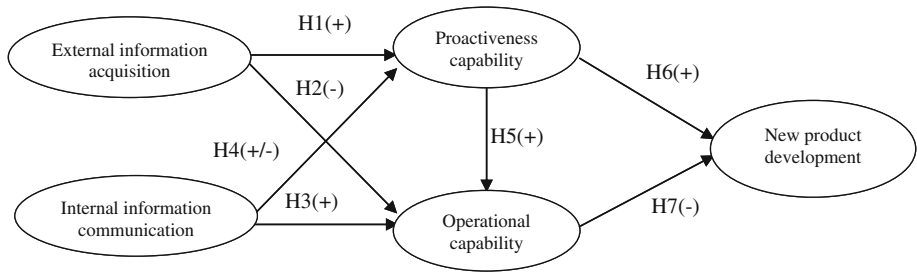


Fig. 1 Conceptual model

the capability to produce and deliver the required products through effective management of its operations. “Capability” refers to the knowledge, skills, and related routines that constitute a firm’s ability to create and deliver superior value for customers (Day 1994). According to Winter (2003), organizational capability can be divided into operational capability and proactiveness capability.

Operational capability refers to a firm’s ability to keep earning its living over time by producing and selling the same product, on the same scale and to the same target market (Winter 2003; Zollo and Winter 2002). Specifically, operational capability manifests itself in such basic activities as ability to maintain normal production, ability to maintain the speed of production, ability to control the cost of production and management, and ability to market successfully.

Proactiveness capability, however, is different. According to Bhuian et al. (2005), entrepreneurial orientation is a kind of dynamic capability. As one important dimension of entrepreneurial orientation, proactiveness refers to an opportunity-seeking, forward-looking perspective involving active market development, and acting in anticipation of future demand to create change and shape the environment (Lumpkin and Dess 1996). Thus, proactiveness capability is defined as the firm’s ability to explore market opportunities through active market research and first-mover actions. Extant literature suggests that proactiveness capability is critical for firms in highly uncertain markets, like those found in emerging economies such as China (Hoskisson et al. 2000). A firm’s ability to predict and navigate through such changes is invaluable to its success (Gu et al. 2008). Proactiveness capability consists of identifiable and specific organizational processes like ability to lead the market, to shorten the cycle of market development, and to deal with change.

From the above discussion, we construct a theoretical model in Fig. 1 to describe the relationships among information communication, organization capability and NPD, all of which must be considered simultaneously.

3 Hypothesis development

3.1 External information acquisition and organizational capability

External information acquisition refers to all activities by which firms access information and knowledge through their customers (Yli-Renko et al. 2001), through their suppliers (Takeishi 2001), and through public sources such as presentations at conferences, journals, books and patents within an industry (Appleyard 1996).

External information acquisition can create the new knowledge necessary for both kinds of organizational capability, proactive and operational. First, external information acquisition can create more new knowledge, which will be helpful for firms to master new skills for product design and to operate in new markets (Danneels 2002). Calantone et al. (2002) note that firms which emphasize external information acquisition will have more opportunities to attain state-of-the-art technology and thereby enhance their adaptability to environmental change. Similarly, Teece et al. (1997) argue that proactiveness capability can be established in successfully innovative firms by paying close attention to market change. Second, external information acquisition can offer timely information about changes in the environment (e.g., customer preferences and governmental regulations), changes which may create opportunities (Morris 1998). By using information collected from outside, managers can predict changes in customers' preferences more precisely and develop new products more profitably. Firms that seize these opportunities can gain competitive advantage over their competitors in new markets. Moreover, many firms seek to improve their ability to deal with complex conditions and environmental change by exchanging information with external cooperators and learning from each other, in order to develop new knowledge (Hanssen and Snow 1996). Therefore, we propose,

Hypothesis 1 External information acquisition is positively related to a firm's proactiveness capability.

Hypothesis 2 External information acquisition is positively related to a firm's operational capability.

3.2 Internal information communication and organizational capability

Internal information communication refers to activities by which organization members exchange and share important information and knowledge within the organization.

Operational capability relies extensively on existing knowledge (Eisenhardt and Martin 2000), so internal information communication is always helpful in building the base for a firm's normal operations, and it exerts great influence on the firm's operational capability in two ways. First, internal information communication can help organization members share their knowledge and experience. Employees can improve their knowledge level and operational ability through internal information exchange and sharing (Yelle 1979). Evidence from the learning curve literature also suggests that sharing accumulated experience through internal information communication can lead to higher production efficiency (Argote et al. 1990). Second, internal information communication can help organization members become aware of the overall performance implications of their innovation actions and thus help firms improve their operation skill (Zollo et al. 2002). With the rapid development of market economics, Chinese firms face significant causal ambiguity between their decisions, actions and performance implications in NPD. Through effective information communication, collective discussions, debriefing sessions, performance evaluation processes and so on, organization members can share their experiences and compare their opinions with their colleagues in the NPD process. Thus, an improved level of understanding of the causal relationship between their actions and the NPD outcome can be achieved, thereby providing the necessary knowledge base for the development and adjustment of operational capability. Therefore, we propose,

Hypothesis 3 Internal information communication is positively related to a firm's operational capability.

The relationship between internal information communication and proactiveness capability, however, is more complicated. Some researchers argue that internal information communication can improve organizational proactiveness capability, especially for firms which emphasize advanced knowledge sharing (Zollo and Winter 2002). They find that internal information communication can help organization members improve their knowledge level and work skills and can thereby help firms more effectively adapt to the environment. Therefore, internal information communication will enhance organizational proactiveness capability.

It can, however, also be counter-argued that internal information communication may be harmful to proactiveness capability and create core rigidities because it does not create new knowledge (Leonard-Barton 1992). Especially when firms face a rapidly changing environment, focusing on internal information communication leads organization members merely to exploit existing knowledge rather than explore new knowledge, thus consigning them to the status quo (March 1991; Cohen and Levinthal 1990). Ingram and Baum (1997) also find that organizations initially benefit by learning from their own experience, but eventually reliance on this experience comes to hurt them. Empirical evidence also suggests that excessive reliance on internal knowledge has a negative effect on performance, since it can lead to capability traps (Levinthal and March 1993). Therefore, we address this paradox by proposing both Hypothesis 4a and b:

Hypothesis 4a Internal information communication is positively related to a firm's proactiveness capability.

Hypothesis 4b Internal information communication is negatively related to a firm's proactiveness capability.

3.3 Proactiveness capability and operational capability

As China moves toward a market economy, many foreign firms have rushed into the market. Local firms, to survive the competition, must not only exploit their existing capabilities but also develop new ones through such means as organizational learning and internal R&D (Zhou et al. 2005).

To leverage the important role of proactiveness capability, local firms need to develop stronger operational capability. Without such strong operational capability, local firms in China cannot adapt to environmental changes effectively, and this ability to adapt is essential for the firms to deal with environment uncertainty. Furthermore, proactiveness capability can promote the development of operational capability. Through information communication and learning, explicit knowledge from outside will be absorbed and transformed into tacit knowledge and lead to the evolution of the firm's knowledge base (Nonaka and Takeuchi 1995). In this ongoing process, initial proactiveness capability may eventually become a part of the firm's operational capability, causing the latter to be enhanced (Cepeda and Vera 2007). Similarly, Zollo and Winter (2002) argue that when influenced by higher-level proactiveness capability, organization operational capability will grow greatly. Zott (2003) also contends that dynamic capabilities are indirectly linked with firm performance because they change the firm's bundle of resources, operational routines, and competencies and in turn affect economic performance. Therefore, proactiveness capability will positively influence operational capability directly. Hence, we propose the following:

Hypothesis 5 A firm's proactiveness capability is positively related to its operational capability.

3.4 Proactiveness capability and NPD

NPD is defined as the development of products or services which are significantly different from a firm's previous ones (Utterback and Abernathy 1975). In order to make NPD a success, firms need to pay more attention to market changes and be market-oriented.

The proactiveness capability of firms will influence their NPD in the following two ways. First, proactiveness capability can help a firm find new markets, adjust its production processes and seize all emerging opportunities (Danneels and Kleinschmidt 2001). Second, proactiveness capability can help organization members learn and master new knowledge and skills necessary for the design of NPD, and shorten the product development cycle as well as reduce risks involved in innovation process (Danneels 2002). Moreover, proactiveness capability can improve a manager's decision-making ability and thereby contribute to the continuity and efficiency of NPD (Paladino 2008).

Because the economy is in transition, Chinese firms' NPD is generally characterized by dynamic features. NPD is a dynamic and iterative problem-solving process in which complex interactions are required in order to combine and exploit technical and marketing capabilities to create product functions and features that meet market demand (Marsh and Stock 2003). Moreover, firms can respond to market changes through NPD based on proactiveness capability (Teece et al. 1997). Furthermore, the improvement of proactiveness capability means that firms gain more knowledge about the design of new product features, better quality and so on, which will lead to further NPD (Lawson and Samson 2001). Therefore, we propose:

Hypothesis 6 A firm's proactiveness capability is positively related to NPD.

3.5 Operational capability and NPD

Product innovation is only one part of the NPD process. Moving from innovation to mass production is quite a different thing, and it requires operational capability (Florida and Kenney 1990). According to Pisano and Wheelright (1995), maintaining efficient operational capability can improve NPD in several ways. First, tremendous time advantages are possible by integrating operation capability into the NPD process. Lower operational capability does not ensure prototype development and testing, and it will therefore reduce the success rate of NPD. Second, because product characteristics and process technology are tightly linked (Utterback and Abernathy 1975), excellent operational capability can positively affect the ability of the firm to deliver high quality products. Therefore, it is necessary for firms to maintain excellent operational capability in order to sustain the market success of NPD. Therefore, we propose:

Hypothesis 7 A firm's operational capability is positively related to NPD.

4 Methods

4.1 Sampling and data collection

To test these hypotheses, a questionnaire-survey approach was adopted for data collection.

China is an ideal context for this study for two reasons. First, as the largest and fastest growing transitional economy, China has attracted many foreign firms to enter and operate in its market. Hence, NPD becomes critically significant for the survival of local firms in China facing this increasing competition. Second, China has been changing continuously to a market economy in recent decades. The massive and rapid changes in China create complex and heterogeneous industrial dynamics that greatly challenge business operations (Zhou et al. 2005). Therefore, the Chinese context provides a rich ground for examining the role of organizational capability in transitional economies and its effect in NPD.

Special care was taken in the sampling process. First, in the literature review, we identified measurement scales and modified them to suit the research purpose of our study. We supplemented the modified scales through interviews with senior managers involved in NPD activities. All the measures were professionally translated and back translated to ensure conceptual equivalence. To ensure the quality of data collection, a face-to-face interview method was adopted to train interviewers. Second, a pilot study was conducted with 15 firms (which were excluded from the final sample of this study), and we revised the initial questionnaire based on the feedback from the pilot study. Third, in addition to providing detailed written instructions to the interviewers, we briefed them on the specific objectives of this study and trained them in interview techniques to help minimize the possibility of misinterpretation of the questions.

A total of 850 enterprises were approached. Due to company policy of nonparticipation in the survey, company liquidation, and inadequate completion of the survey instrument, some firms were excluded from the final data analyses. A total of 607 firms provided all the necessary data. The effective response rate was therefore 71.41 percent (607 out of 850), which is very high, given the fact that these survey questionnaires were completed mostly by CEOs or their direct designees. We attribute our success to advanced planning, careful pilot study, and effective field interview execution.

Two issues commonly raised concerning survey methodology are nonresponse bias and common method variance (Lambert and Harrington 1990; Podsakoff and Organ 1986). Nonresponse bias represents the difference between the answers of respondents and those of nonrespondents (Lambert and Harrington 1990). The ownership status and sales revenue of 171 nonresponding firms were obtained, and the responding and nonresponding firms were compared along these major firm attributes using *t*-tests. All *t*-statistics were insignificant. Further, by means of a X^2 test of independence (i.e., firm size, ownership status, and age), the responding firms were compared with the nonresponding firms; again, no significant differences were found.

The possibility of common method variance also was examined via Harman's one-factor test for all variables in the study. Factor analysis showed that no general factor was found in the unrotated factor structure, with the first factor accounting for only 19.9 percent of total variance and the independent and dependent variables loading on different factors. Because a dominant single factor does not emerge, common method bias is unlikely to be a concern in our data (Podsakoff and Organ 1986).

4.2 Measures

All the measures in our study are grounded in literature and adopted from previous studies which have been validated by those researchers. Modifications have been made for the Chinese transitional context. All multi-item measures are based on 7-point Likert scales, from 1 (strongly disagree) to 7 (strongly agree).

4.2.1 External information acquisition

Based on the measurements developed by Almeida and Kogut (1999) and Lee et al. (2001), external information acquisition was measured using five items: (1) collecting information about customer demand and preference, (2) collecting suppliers' strategic information, (3) observing trends in technology development, (4) conducting special market surveys, and (5) collecting information through industry journals, government publications, news etc.

4.2.2 Internal information communication

We measured internal information communication by the following five items developed from Lahteenmaki (2001): (1) managers often exchange information about the firm's competitors, (2) experience about how to serve customers is shared among functional management departments, (3) all functional management departments work together to serve the same customers, and (4) functional management departments have a strong desire to learn from one another.

4.2.3 Proactiveness capability

Proactiveness capability refers to a firm's competitiveness in exploring market opportunities through active market research and first mover actions, and in dealing with changes in the environment (Lumpkin and Dess 1996; Winter 2003). We measured proactiveness capability using four items: (1) ability to lead the market, (2) ability to shorten the cycle of market development, (3) ability to operate in new markets, and (4) ability to deal with changes in the environment.

4.2.4 Operational capability

Based on the research of Collis (1994) and Winter (2003), operational capability was measured using three items: (1) ability to maintain effectiveness in the production process, (2) ability to maintain the speed of production, and (3) ability to control the cost of production and management.

4.2.5 New product development

NPD was measured by using four items derived from Danneels and Kleinschmidt (2001): (1) we develop products with completely new functions, (2) we develop products with new styles or service, (3) we introduce the concept of new products into R&D, and (4) our probability of success in NPD is very high. Table 1 presents descriptive statistics for information communication, organizational capability, and NPD, in addition to a matrix of correlations for these variables.

4.3 Construct validity

We examined construct validity as follows. First, we ran exploratory factor analyses for external information acquisition, internal information communication, proactiveness capability, operational capability, and NPD. Factor solutions were consistent with theoretical postulates. Second, to assess the convergent and discriminant validity of the constructs, confirmatory factor analysis was conducted. We allowed the latent constructs to be

Table 1 Descriptive statistics and correlation matrix

Variables	Mean	SD	1	2	3	4
1. External information acquisition	4.625	0.989				
2. Internal information communication	4.443	0.923	0.553***			
3. Proactiveness capability	4.260	1.108	0.263***	-0.273***		
4. Operational capability	4.717	1.110	-0.278***	0.243***	0.680***	
5. New product development	3.909	1.413	0.179***	0.203***	0.430***	0.109*

Significance level: * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$

correlated while constraining the measurement items and their error items to be uncorrelated. Both models provide satisfactory fit (see Table 2), indicating the unidimensionality of the measures (Anderson and Gerbing 1988). Loadings of items on their respective factors are all positive, high in magnitude, and statistically significant, showing that the scale has satisfactory convergent validity (Anderson and Gerbing 1988). We conducted a series of confirmatory factor analyses, as Bagozzi (1980) recommends. The results suggest that for every pair of factors in the measurement model, a two-factor model fits the data significantly better than a one-factor model, demonstrating satisfactory discriminant validity. Taken together, the measures show good convergent and discriminant validity.

5 Analysis and results

Having satisfied the requirement arising from measurement issues, the relationships depicted in the hypotheses and shown in Fig. 1 were subsequently tested using structural equation modeling (SEM). The primary aim of SEM is to explain the pattern of a series of inter-related dependence relationships simultaneously between a set of latent (unobserved) constructs, each measured by one or more manifest (observed) variable. The measured (manifest) variables in SEM have a finite number of values, and these variables are gathered from respondents through data collection methods. They are represented by numeric responses to a rating scale item on a questionnaire. In contrast, latent (unobserved) variables are not directly observed, have an infinite number of values, and are usually continuous.

Table 3 presents the standardized maximum likelihood parameter estimates for the hypothesized path model. The results indicate a good fit of the model: $\chi^2 = 175.18$, the ratio of Chi-square to degree of freedom is 1.055, GFI = 0.976, AGFI = 0.956, IFI = 0.999, CFI = 0.999, and RMSEA = 0.010. Figure 2 illustrates the hypothesized model with the parameter estimates for the hypothesized relationships.

Hypothesis 1 suggests that external information acquisition has a positive impact on proactiveness capability. Table 3 shows that external information acquisition registers a significant influence on proactiveness capability (0.357, $p < 0.01$), thus supporting Hypothesis 1. There is, however, a significant negative relationship between external information acquisition and operational capability (-0.233, $p < 0.01$), and thus Hypothesis 2 is not supported. Hypothesis 3 predicts that internal information communication has a positive impact on operational capability. The results show that internal information communication has a significant influence on operational capability (0.253, $p < 0.001$), providing support for Hypothesis 3. With regard to Hypothesis 4, we find that internal

Table 2 Measurement items and validity assessment

Constructs and scale items	Standardized loading
External information acquisition ($\alpha = 0.82$; CR = 0.82; AVE = 0.59)	
(1) Collecting information about customer's demand and preference	0.679
(2) Collecting suppliers' strategic information	0.703
(3) Collecting the trend of technology development	0.735
(4) Conducting special market survey	0.708
(5) Collecting information through industry journal, government publications, and news	0.645
Internal information communication ($\alpha = 0.80$; CR = 0.81; AVE = 0.63)	
(1) Managers often exchange information about firm's competitors	0.628
(2) Experience about how to serve customers was shared among functional departments	0.808
(3) All functional departments work together to serve the same customers	0.782
(4) The will to learning each other among functional departments is very strong	0.626
Proactiveness capability ($\alpha = 0.82$; CR = 0.83; AVE = 0.65)	
(1) Ability to lead market	0.760
(2) Shortening the cycle of market development	0.811
(3) Ability to operate in new market	0.676
(4) Ability to deal with change in environment	0.697
Operational capability ($\alpha = 0.82$; CR = 0.83; AVE = 0.74)	
(1) Ability to keep production process effectively	0.844
(2) Ability to keep production speed	0.867
(3) Ability to control the cost of production and management	0.639
New product development($\alpha = 0.77$; CR = 0.77; AVE = 0.59)	
(1) Develop product with completely new functions to sell	0.703
(2) Develop product with new style or service to sell	0.628
(3) Introduce new product concept into R&D	0.750
(4) Our new product development has a high success rate	0.622

α Cronbach's alpha, CR composite reliability, AVE average variance extracted

Table 3 Structural equations modeling results

Hypothesis	Standardized path coefficient	<i>p</i> -value
1: External information acquisition → Proactiveness capability	0.357	0.008
2: External information acquisition → Operational capability	-0.233	0.006
3: Internal information communication → Operational capability	0.253	0.000
4: Internal information communication → Proactiveness capability	-0.307	0.027
5: Proactiveness capability → Operational capability	0.895	0.000
6: Proactiveness capability → New product development	0.431	0.042
7: Operational capability → New product development	0.050	0.817

Fit statistics of the final model: $\chi^2 = 175.18$, $\chi^2/\text{d.f.} = 1.055$, GFI = 0.976, AGFI = 0.956, IFI = 0.999, CFI = 0.999, RMSEA = 0.010

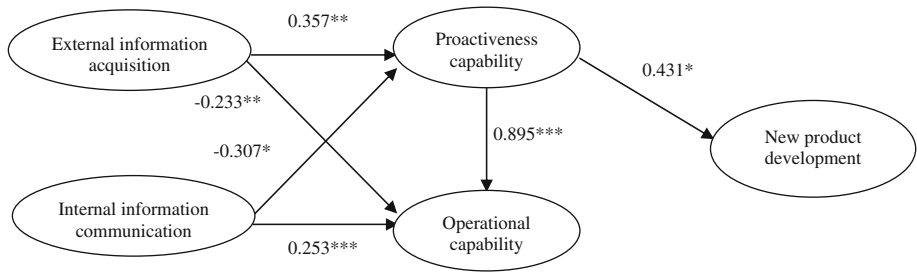


Fig. 2 Final tested model. Notes * $p < 0.05$; ** $p < 0.01$, *** $p < 0.001$

information communication is significantly and negatively associated with firm's proactiveness capability ($p < 0.05$), lending support to Hypothesis 4b (i.e., the negative relationship) but not to Hypothesis 4a (i.e., the positive relationship). Table 3 shows that proactiveness capability is positively related to operational capability (0.895, $p < 0.01$), in support of Hypothesis 5. In support of Hypothesis 6, proactiveness capability is positively related to NPD (0.431, $p < 0.05$). The path coefficient from operational capability to NPD is 0.05 ($p > 0.10$), which is not significant, so Hypothesis 7 is not supported.

6 Discussions and conclusion

6.1 Theoretical Implications

The purpose of this study is to shed light on the relationship between information communication and NPD from an organizational capability view. By introducing organizational capability as a mediator and testing its impact on NPD, this research extends the literature on information communication, organizational capability, and NPD in general and provides the following theoretical implications.

First, by distinguishing between external information acquisition and internal information communication, we find that the effects of the two forms of information communication on organizational capability are different. Specifically, we find that external information acquisition positively affects proactiveness capability, thus empirically confirming the theoretical views of Zollo et al. (2002) and Eisenhardt and Martin (2000), who argue that external information acquisition is necessary in order for firms to adapt to environment change and is also the base on which firms can establish proactiveness capability.

Contrary to our expectation, however, we have found that external information acquisition is negatively related to operational capability. One plausible explanation for this finding is that operational capability relies much more on a firm's existing knowledge. New knowledge generated from external information acquisition can change the firm's knowledge base continuously and cause cognition inconsistency among employees in the short term, negatively influencing the firm's current operational capability. A second plausible explanation is that external information acquisition can also help Chinese managers to identify their firm's weaknesses and promote internal operation reform. The operational capability of Chinese local firms is relatively weak (Tan 2001), and thus managers want to renew their firms' existing operational capability by learning from

western firms (Zhou et al. 2005). During this process, firms usually have to destroy their current operational ways and then establish new ones.

We find that internal information communication is positively related to operational capability, consistent with the findings of Ingram and Baum (1997). This finding suggests that organization members can enhance their knowledge and skills through internal information communication, and it shows firms how to sustain production processes and control production and management costs effectively. Consistent with Hypothesis 4b, we find that an increase in internal information communication is harmful for the development of proactiveness capability. This finding is consistent with those of Ingram and Baum (1997), who argue that excessive reliance on internal knowledge and experience has a negative effect on firm's performance and adaptability to environment change.

Second, by introducing proactiveness capability and operational capability, we reveal that organizational capability is an important mediator between information communication and NPD. These findings provide new insights into the relationship between information communication and NPD, and deepen our understanding into the role of organizational capability in NPD. Previous studies on organizational capability have been largely conceptual in nature, and few have explored the process underlying its development (Eisenhardt and Martin 2000; Zollo and Winter 2002; Winter 2003). By empirically examining the effects of the two forms of information communication on organizational capability, we find that information acquisition and communication are important antecedents of organizational capability. Although these results are tentative given the limitations of a survey study, they are significant because our findings to some degree advance organizational capability theory.

Third, we find that proactiveness capability positively affects operational capability. This finding is consistent with the study of Cepeda and Vera (2007), who suggest that the deployment of proactiveness capabilities is the cornerstone of new operational capabilities, and organizational learning is the driving force of organizational capability evolution. Our findings indicate that the leveraging of proactiveness capability needs strong operational capability as a base, and that operational capability will be improved by incorporating new knowledge into a firm's existing knowledge through internal information communication.

Finally, we find that organizational proactiveness capability is positively related to NPD, consistent with the study of Li and Calantone (1980), who argue that firms' market knowledge can improve their ability to innovate and therefore further create competitive advantages for themselves. The findings suggest that proactiveness capability and NPD can enable a firm to adapt to environmental change, and that the market orientation of NPD also exactly reflects the dynamic features of the firm's adaptation to the market. However, our empirical tests reveal a non-significant relationship between operational capability and NPD. A plausible reason may be that operational capability relies much more on existing knowledge, whereas NPD mainly relies on new knowledge or information, such as new trends in customers' preferences or new technology development, which cannot be created by operational capability. The direct influence of operational capability on NPD is thus insignificant.

6.2 Managerial implications

Besides the above theoretical implications, this study provides some important implications for managers. First, in a rapidly changing environment, local firms in China should emphasize external information acquisition to improve their proactiveness capability. Contrary to our expectation, we find that the relationship between external information

acquisition and operational capability is negative; however, this result should not be interpreted to mean that external information acquisition is not important. We believe that external information acquisition may exert a negative impact on the operational capability of firms in the short term, but that it still plays an important positive role in their long-term development.

Second, managers should note that, although internal information communication is very important, depending extensively on internal information and ignoring external information acquisition will be very dangerous and will hamper a firm's development. For most Chinese firms, their current knowledge and technology base is relatively weak and backward (Chen and Boggs 1998). If they simply emphasize internal information communication and ignore external information acquisition and learning, their organizational inertia and core rigidities will be further reinforced, and the gap between them and their western counterparts will become greater. Thus, internal information communication and external information acquisition should be emphasized in parallel, and organization members can enhance their knowledge level through learning new knowledge from outside.

Third, Chinese managers should note that operational capability provides a means for leveraging proactiveness capability in firms. To leverage the important role of proactiveness capability and adapt to an ever-changing environment, Chinese firms must continuously enhance their operational capability.

Fourth, the non-significant relationship between operational capability and NPD implies that it is very difficult for Chinese firms to conduct NPD by relying only on operational capability in the current transitional economy. Thus, they should seek help from outside and enhance their proactiveness capability through technology introduction or collaboration in order to further improve their product performance.

6.3 Limitations and further research

This study has several limitations that imply caution in generalizing the findings and raise a number of opportunities for further research.

First, the results of the current study are context-specific. Although we believe it is theoretically feasible to extend this study to other contexts, the specific differences between China and other transition economy countries may restrict the generality of our findings. Therefore, a useful extension would be to conduct this study in other transitional environments.

Second, the institutional environment in which organizational capability is embedded may be evolving. To fully test the dynamics of the relationship among information communication, organizational capability and NPD, we should examine the relationships over time. Our cross-sectional sample design clearly constrains our capacity to carefully and fully examine the nature of the relationship that we observe. Thus longitudinal data or experimental methods are needed to fully test the dynamics of these complex relationships.

Third, we examine the impact of proactiveness capability on operational capability in this paper, but in fact the reverse also happens: operational capability has an effect on proactiveness capability. Therefore investigating how operational capability affects proactiveness capability will provide a more complete picture of the relationship between them.

Finally, we simply focus on the impact of information communication, organizational capability on NPD, and do not address their potential impact on other kinds of innovation, such as incremental and radical innovation and so on. It would be useful to conduct in-

depth studies to better understand how other kinds of innovation can be influenced by information communication and organizational capability.

6.4 Conclusion

In this study, we conceptually argue and empirically confirm the links between information communication, organizational capability and NPD. We find that that external information acquisition positively affects proactiveness capability and negatively affects operation capability. Internal information communication has a negative effect on proactiveness capability and a positive effect on operation capability. Furthermore, proactiveness capability has a positive effect on operational capability and NPD. This research contributes to reconciling the mixed findings between information communication and NPD, thereby deepening our understanding of the role of organizational capability in NPD. From these results, firms should emphasize the different effects of the two forms of information communication on organizational capability, and leverage the positive role of proactiveness capability in NPD to strengthen their competitive advantage.

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