The effects of innovation speed and quality on differentiation and low-cost competitive advantage

The case of Chinese firms

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Abstract

Purpose – This paper aims to verify the effect of organizational learning (OL) and two specific aspects of innovation, innovation speed and innovation quality, on competitive advantage.

Design/methodology/approach – Structural equation modeling has been applied to test the degree of influence of OL and innovation on two types of competitive advantage (differentiation and low-cost advantage) using data collected from 279 Chinese firms.

Findings – The findings show that innovation speed and quality play mediating roles in the relationship between OL and competitive advantage. In general, while innovation speed has greater effects on low-cost competitive advantage, OL and innovation quality have greater effects on differentiation competitive advantage.

Research limitations/implications – This paper offers directors/managers a deeper understanding of the factors necessary to promote competitive advantage in their firms.

Practical implications – This paper offers CEOs/managers a deeper understanding of the necessary factors needed to promote competitive advantage in their firms.

Originality/value – This paper provides practical and theoretical initiatives on innovation and competitive advantage that can be used to promote specific aspects of innovation and build up competitive advantage for relevant organizations.

Keywords Organizational learning, Differentiation competitive advantage, Innovation quality, Innovation speed, Low-cost competitive advantage

Paper type Research paper

1. Introduction

Since the reform and opening up its economy began in 1978, China has become an important emerging market (Ma et al., 2008; Xiang and Wu, 2012). Innovation plays a vital role in attaining competitive advantage and improving organizational performance in rapidly
changing business environments (Tidd et al., 2005; Chew et al., 2008; Birasnav et al., 2013; Tamayo-Torres et al., 2016; Gomes and Wojahn, 2017). Thus, many Chinese firms are attempting to become innovators to confront higher market complexity and increasing competitive intensity (Song, 2015). Accomplishing these goals requires the identification of effective pathways by which Chinese firms can successfully diversify forms of innovation, attain competitive advantage and meet the specific demands of customers (Hua et al., 2011; Song, 2015).

The theory of organizational learning (OL) has emerged as one of the most appropriate antecedents for improving the innovation capacity and competitive advantage of firms (Chahal and Bakshi, 2015; Song, 2015; Imran et al., 2016; Tamayo-Torres et al., 2016; Lei et al., 2017). According to Tamayo-Torres et al. (2016), OL positively affects strategic fit and competitive advantage based on the mediating role of innovation capacity. In addition, Wang and Ellinger (2011) noted that further empirical studies investigating the crucial potential of learning capability are warranted. Thus, this study provides further empirical evidence and more deeply explores the mechanism by which OL can promote innovation speed and quality to affect the specific aspects of competitive advantage (differentiation and low-cost competitive advantage).

The literature provides support for the necessity and novelty of this study. First, the literature on innovation classifies this concept into various categories (Liao et al., 2007), among which innovation speed and innovation quality are recognized as two critical characteristics of innovation in complex and rapidly changing business environments (Wang et al., 2016). Anderson et al. (2014) emphasized the necessity of identifying the antecedents of specific aspects of innovation by posing a question for future research: “What is the relationship between organizational resources and different types of organizational innovation?” In addition, OL capability is considered a strategic resource for maintaining long-term organizational success (Senge, 1990). Therefore, studies of how OL can affect innovation speed and quality to help firms achieve competitive advantage are very necessary.

Second, Prieto and Revilla (2006) highlighted the necessity of identifying the consequences of learning capability, i.e. the various factors that are affected by learning capability. Accordingly, this study advances the understanding of OL theory by exploring the different effects of OL on innovation and competitive advantage more clearly.

Third, according to Tamayo-Torres et al. (2016), most firms consider OL and innovation key foundations of organizational capabilities to compete in a dynamic environment. However, studies of the complex interactions among OL, innovation and competitive advantage are lacking, and thus the contributions of OL and innovation to competitive advantage remain unclear (Tamayo-Torres et al., 2016).

In general, although OL and innovation are recognized as important sources of competitive advantage (Chahal and Bakshi, 2015), empirical research investigating the relationship between OL, aspects of innovation (innovation speed and innovation quality) and competitive advantage in a model is scarce. This knowledge gap limits the understanding of the different ways in which OL may effectively influence competitive advantage. To better understand the correlations between these constructs, the structural equation modeling is applied here to investigate the degree of influence each variable exerts on the others based on a survey of 279 CEOs/managers from 279 firms in China. This study attempts to address the following research questions:

**RQ1.** Does OL influence both types of competitive advantage (differentiation and low-cost competitive advantage) in any significant way?
RQ2. Do innovation quality and speed play mediating roles between OL and competitive advantage?

RQ3. Which factor, innovation speed or innovation quality, has a greater influence on each type of competitive advantage?

The remainder of this study is organized as follows: Section 2 explores the literature and hypotheses; Section 3 describes the research methodology for testing the model and data collection; and Section 4 analyzes the data and discusses the empirical results. Finally, conclusions, managerial implications, limitations and proposals for future research are provided in Section 5.

2. Theory and hypotheses

An organization is said to achieve competitive advantage if it occupies some position by implementing and gaining sustainable benefits from a value-creating strategy (Porter, 1985). According to Porter’s (1985) typology of competitive strategy, firms should rely on their own resources to shape the activities that create a low-cost advantage and/or differentiation advantage. Porter recognized that many firms can reduce costs while preserving or even increasing their differentiation. Recently, researchers have also provided evidence that a firm can simultaneously achieve two types of competitive advantage: differentiation and low-cost (Santos-Vijande et al., 2012; Molina-Azorín et al., 2015). The identification of factors that help firms simultaneously obtain these forms of competitive advantages is important to satisfy the diverse demands of customers and meet the increasing competitive intensity of business environments.

Although previous research has highlighted the relationships among OL, innovation and competitive advantage, studies of the correlations between OL and these two types of competitive advantage, especially the correlations between the two crucial components of innovation (innovation speed and innovation quality) and the aspects of competitive advantage, are limited. This section focuses on the existing literature on OL, innovation and competitive advantage to develop testable hypotheses.

2.1 Organizational learning and innovation

The topic of OL has attracted a great deal of attention in social science research, and the OL concept is expressed in a variety of ways. For example, some view OL as a process that constantly creates, shares, disseminates and integrates new knowledge and incessantly modifies its actions based on new knowledge and awareness, with the purpose of achieving intended strategic goals (Garvin, 1993; Marquardt, 1996; Lewis, 2002). Senge (1990) viewed OL as a dynamically balanced relationship in which organizations acquire external knowledge and further adjust their activities for the purpose of survival and growth. According to Armstrong and Foley (2003), OL helps firms develop mechanisms and processes to encourage workplace learning for both individuals and groups. By emphasizing the organization’s capabilities of gathering and using knowledge to support innovation and attain competitive advantage, this study considers OL as a firm’s capability to acquire, share and apply knowledge to effectively solve the organization’s important issues and sustain competitive advantage (Aragón-Correa et al., 2007; King et al., 2008; Wang and Ellinger, 2011; Chahal and Bakshi, 2015).

Innovation has been defined as the adoption or creation of new products, services, work processes and management procedures to gain an organizational competitive advantage (Drucker, 2014). In an unstable environment, innovation refers not only to the generation, acceptance and implementation of new ideas, processes, products and services but also to
the capacity to change or adapt (Calantone et al., 2002). Depending on the criteria, innovation can be classified into various categories, such as product innovation, process innovation and managerial innovation (Liao et al., 2007). Wang et al. (2016) separated innovation into innovation speed and innovation quality. Innovation speed reflects a firm’s ability to minimize the time required to create new products or processes relative to its competitors (Allocca and Kessler, 2006). Innovation quality reflects a firm’s innovative ability to improve management and processes and to supply new products and services of better quality than those of key competitors (Haner, 2002; Wang et al., 2016). This classification is used here because innovation speed and quality reflect two critical characteristics of successful innovation in a complex environment (Wang et al., 2016).

Many works in the extensive and diverse literature on organizational innovation have demonstrated a positive relationship between OL and firm innovation (Hurley and Hult, 1998; Jiménez-Jiménez and Sanz-Valle, 2011; Sony and Naik, 2012; Song, 2015). Specifically, OL has been supposed to play a decisive role in creating innovations and to positively influence innovation (Hurley and Hult, 1998; Jiménez-Jiménez and Sanz-Valle, 2011). Sony and Naik (2012) argued that the acquisition of new knowledge in the OL process is the primary innovation resource. Consequently, the use of existing knowledge helps firms develop new ideas, promote productivity and stimulate creation. The learning ability of an organization not only enhances the absorption and assimilation of internal information but also improves innovation activity efficiency and capabilities.

Despite a recent lack of attention, previous studies have also provided support for a positive relationship between OL and the two specific types of innovation. OL is the process of acquiring and sharing knowledge (Slater and Narver, 1995; Weerd-Nederhof et al., 2002) and is positively correlated with various aspects of innovation (Wang et al., 2016). Wang et al. (2016) also indicated that OL’s process of knowledge sharing has significant impacts on both innovation speed and innovation quality. OL helps firms create new products or processes more quickly than competitors (innovation speed) because:

- learning capability improves the likelihood of continuously adapting to new situations and adjusting to the demands of the environment (Song, 2015); and
- OL increases the flexibility and speed of responses to new challenges compared to the competitors (Santos-Vijande et al., 2012).

In addition, OL helps firms improve the quality of new products and/or processes and the end result of innovation relative to key competitors (innovation quality) by enhancing the ability to understand and apply new ideas (Damanpour, 1991), favoring organizational intelligence, providing a background for orientation to organizational innovation (García-Morales et al., 2012) and increasing the absorption and assimilation of internal information as well as the efficiency, efficacy and capabilities of innovation activity (Sony and Naik, 2012).

In summary, the above arguments support a positive relationship between OL and innovation and between OL and the two aspects of innovation (i.e. innovation speed and innovation quality). Although innovation speed and quality are viewed as extremely important aspects of innovation that broadly improve the performance of an organization (Wang et al., 2016), research directly analyzing the specific influence of OL on these two types of innovation remains scarce and limited. To obtain a deeper understanding of the different mechanisms by which OL may impact each aspect of innovation, the following hypothesis is proposed:

\[H1a.b.\] OL has a positive impact on innovation speed and innovation quality.
2.2 Organizational learning and competitive advantage

Several scholars consider the concept of OL the norm for achieving organizational profitability and obtaining sustainable competitive advantage (Thomas and Allen, 2006; Davis and Daley, 2008). OL has a positive impact on a firm’s competitive advantage because of its significant and positive impacts on human resource performance and firm operating performance (Azadegan and Dooley, 2010; Bell et al., 2010). Santos-Vijande et al. (2005) emphasized that OL expands the ability to develop successful strategies for establishing and maintaining profitable customer relationships. Therefore, a firm with good OL performance will not only cope well with the opportunities and threats of emerging markets but also use its resources effectively to meet market trends and demands (Chauhan and Bontis, 2004; Yeung et al., 2007). Many previous studies have evaluated OL as the basis to attain competitive advantage for firms (Brockman and Morgan, 2003; Davis and Daley, 2008; Gould, 2009; Santos-Vijande et al., 2012).

In many ways, OL contributes considerably to both differentiation and low-cost advantage. In this regard, the significant and positive effects of OL’s process of knowledge sharing on a firm’s cost management and productivity compared with key competitors (Wang et al., 2016) helps minimize costs and successfully provide a low-cost advantage. In addition, the significant and positive effect of OL’s process of knowledge sharing on the quality development of products and services as well as customer satisfaction compared with key competitors (Wang et al., 2016) enable firms to achieve a differentiation advantage. Santos-Vijande et al. (2012) reported that OL is positively related to the implementation of both differentiation and cost-leadership strategies. Recently, Lei et al. (2017) also provided evidence that OL has significant impacts on both the differentiation and low-cost competitive advantages of a firm.

Although many previous studies have noted a positive relationship between OL and competitive advantage, few have examined the relationship between OL and these two specific types of competitive advantage in a model, especially in the Chinese context. The following hypothesis is consequently proposed:

H2a.b. OL has a positive impact on differentiation and low-cost competitive advantage.

2.3 Innovation and competitive advantage

Innovation has been recognized as an important factor for firms to create value and influence competition (Mintzberg, 1994). Innovation is rapidly becoming a crucial factor in company performance and survival as a result of the evolution of the competitive environment (Campos and de Pablos, 2004; Hinterhuber and Liozu, 2014). Innovation helps firms adapt to the uncertainty of external environments and generally represents one of the most important factors for the long-term success of businesses, particularly in dynamic markets (Balkin et al., 2000; Baker and Sinkula, 2002). According to Wang and Wang (2012), innovation allows firms to make full use of existing resources, improve efficiency and potential value and bring new intangible assets into the organization. Innovation helps firms attain a competitive advantage in several aspects: market performance, market share maintenance, production shortening and acceleration of new product development (Tidd et al., 2006); operational efficiency and service quality (Hsueh and Tu, 2004; Parasuraman, 2010); and meeting customer’s needs, developing new capabilities, performance and superior profitability (Calantone et al., 2002; Sadikoglu and Zehir, 2010). Success in technology innovation enables firms to create and maintain a competitive advantage (Martin-de Castro et al., 2013).
Business environments are transforming rapidly in a manner that is difficult to control; to attain competitive advantage, firms must be able to provide goods and services to customers at a faster pace and with greater quality. Many firms realize that a slow response to new product developments of the competitors is a latent threat and thus attempt to introduce new products, services or processes as quickly as possible (Boyd and Bresser, 2008; Smith, 2011). Firms can expand their market share if they concentrate on improving innovation speed (Robinson, 1990). As a corollary, innovation speed creates faster responses to relevant environments by allowing new products to be launched in less time and at lower cost, which ultimately improves firm performance (Tidd et al., 2005). When firms take on the task of developing, producing or selling new products faster than their competitors, they can build a market segment based on service quality and efficiency in settings in which their knowledge of innovation is not readily available to competitors (Liao et al., 2010).

Innovation quality also positive influences a firm’s competitive advantage. Haner (2002) demonstrated that different patterns of innovation quality at each level (including the product/service level, process level and enterprise level) reflect different states but all lead to success for relevant firms. Firms can achieve higher performance than their competitors if they pay more attention to innovative R&D (Brentani, 2001; Singh, 2008). A high quality of innovation requires firms to adopt and combine numerous new products, processes or practices throughout all organizational activities. These actions will prevent the imitation of a firm’s activities, thereby stimulating newness and framing the firm’s competitive advantage (Wang and Wang, 2012).

In conclusion, positive relationships between innovation and the aspects of competitive advantage have been demonstrated and discussed by several scholars. Although Weerawardena and Mavondo (2011) suggested that “all types of innovation contribute to a firm’s competitive advantages,” research simultaneously analyzing the specific effects of innovation speed and quality on the two types of competitive advantage in a model remains scarce. To obtain a better understanding of the different ways and mechanisms by which innovation speed and quality may affect differentiation and low-cost competitive advantage, the following hypotheses is proposed:

\[
H3a,b,c,d. \text{ Innovation speed and innovation quality have positive impacts on differentiation and low-cost competitive advantage.}
\]

Regarding the relationships among OL, innovation and competitive advantage, Garvin (1993) affirmed that OL capability helps firms produce unique competencies among employees to foster many aspects of innovation and, consequently, create and maintain competitive advantage. Moreover, Tamayo-Torres et al. (2016) indicated that innovation capacity mediates the relationships of OL with strategic fit and competitive advantage. This study therefore proposes that the aspects of innovation play a mediating role between OL and the two types of competitive advantage.

3. Research method
3.1 Sample and data collection
Measurement items were adapted from scales in the literature to develop an initial list of items. To modify the relevant items to the Chinese context, a pilot test was performed before the process of formal data collection by conducting in-depth interviews with five outstanding academic scholars with deep knowledge of strategic management at three universities. In addition, five CEOs from five different firms were interviewed. A pilot test was conducted with 30 firms to determine the efficiency of the questionnaire.
A random sample of 800 firms in both manufacturing and service industries was selected from the GuoTaiAn Information Technology Co. (CSMAR) database as the sampling frame. CEOs/managers were surveyed because they have a full understanding of their firms and the strategic factors and are familiar with the environment of their firms. Each CEO/manager was mailed a questionnaire and a letter that explained the purpose of the research and offered to provide the research results if the respondent returned the completed questionnaire. To improve the questionnaire return rate, a variety of techniques were used, such as e-mail reminders, direct phone calls and personal visits. Among 800 questionnaires issued, 305 responses were received, of which 279 were valid, corresponding to a validity rate of 32.8 per cent. This response rate is similar to those obtained in other surveys of top management (Wang and Wang, 2012).

Potential nonresponse bias was assessed by following the method proposed by Armstrong and Overton (1977). The \( \chi^2 \) and independent sample \( t \)-test were used to compare the earliest 90 respondents and last 90 respondents based on demographic variables, including gender and age. There were no significant differences between the two groups of responses \( (p > 0.05) \). Therefore, common method bias was not a concern. Of the total 279 respondents, 175 (62.72 per cent) were male, and 104 (37.28 per cent) were female. The respondents answered the questions related to study variables, such as OL, aspects of innovation and competitive advantages in their firms.

3.2 Measures
All items were measured according to a five-point Likert scale ranging from “1” (strongly disagree) to “5” (strongly agree). All model constructs were measured using reflective indicators. Organizational learning was measured by four items reflecting each firm’s capability of acquiring and sharing knowledge and the existing framework for developing employees’ critical skills, ensuring organizational improvements, and competitive advantage. These scales were developed by Aragón-Correa et al. (2007) and García-Morales et al. (2008). Ten items adapted from the research of Wang et al. (2016) were used to measure innovation speed and quality. Innovation speed was measured by five items reflecting, for example, the firm’s ability to accelerate the creation of new products or processes relative to competitors. A sample item is “our organization is quick in coming up with novel ideas compared with key competitors.” Innovation quality was measured by five items reflecting the firm’s innovative abilities to improve management and processes and its abilities to supply new products and services of better quality than those of key competitors. A sample item is “our organization does better in new product development compared with key competitors.” Competitive advantage was measured by seven items expressing the two types of competitive advantage: differentiation and low-cost advantage. Differentiation competitive advantage was measured by four items reflecting strategies for differentiation. A sample item is “Many supplementary services are offered, adding value for customers.” The low-cost competitive advantage was measured by three items reflecting a strategy to make low-cost products. A sample item is “general costs are minimized.” These items were derived from the research of Molina-Azorín et al. (2015).

3.3 Data analysis methods
The analysis of moment structures (AMOS) was used to measure validation and to test the structural model based on the data gathered from the 279 Chinese firms. Data analysis was conducted using SPSS and AMOS version 21. Confirmatory factor analysis (CFA) was implemented to examine the validity and reliability of the constructs. In addition, a
bootstrapping procedure was conducted for the significance tests of the research hypotheses.

4. Results
4.1 Measurement testing
First, the exploratory factor analysis (EFA) was performed to eliminate factors with loadings of less than 0.5 and to ensure the practicality of the research (Hair et al., 1998). We then performed CFA to evaluate the overall measurement model. To evaluate the validity of the measurement model, convergent validity and discriminant validity were obtained. Convergent validity was assessed by considering factor loading, which should be significant and exceed 0.5; the composite reliability (CR), which should exceed 0.6; and the average variance extracted (AVE), which should be greater than 0.5 for all constructs (Fornell and Larcker, 1981). All factor loadings and CR values were in acceptable ranges and significant at the 0.05 level; the factor loadings ranged from 0.64 to 0.94, and CR ranged from 0.89 to 0.92. AVE ranged from 0.65 to 0.75. Thus, our model met the convergent validity criteria. The internal reliability of the scales was evaluated by Cronbach’s alpha (Ca), which ranged from 0.89 to 0.93; values greater than 0.7 are acceptable (Nunnally and Bernstein, 1994). Table I and Table II provide the means, SD, factor loading, AVE, square root of AVE, CR and Ca of every construct.

Discriminant validity is the degree to which factors that are supposed to measure a specific construct do not predict conceptually unrelated criteria (Kline, 2010). This study used Fornell and Larcker’s (1981) measure of AVE to assess discriminant validity. In this approach, the square root of AVE for each construct should be greater than the correlation between the construct and other constructs in the model (Table II).

The results shown in Table II indicate that the measurement model meets the standard of discriminant validity because the square root of AVE for each construct (diagonal elements in italic) is greater than the correlations among constructs in the model. Therefore, all constructs in the measurement model were judged as having adequate discriminant validity.

To measure the degree of fit of the model, the following indicators were evaluated: absolute fit measures, including $\chi^2$/df (CMIN/df), goodness-of-fit index (GFI) and root mean square error of approximation (RMSEA); incremental fit measures, including normed fit index (NFI), adjusted goodness-of-fit index (AGFI) and comparative fit index (CFI); and parsimonious fit measures, including parsimony goodness-of-fit index (PGFI) and parsimony normed fit index (PNFI). On the basis of the results shown in Table III, all fit indices met satisfactory levels, demonstrating that this study had adequate reliability and validity.

4.2 Structural model
This section presents the main results of the hypothesis testing of the structural relationships among the latent variables (Table IV, Table V and Figure 1).

We used the $t$-test as the procedure of Hair et al. (1995) (Table V) to assess the statistical significance of the difference between two coefficients on a common scale (the path coefficients are considered statistically significant at the 5 per cent level if they exceed a value of 2.0). The statistic has been calculated using the following formula:

$$t\text{-value} = \frac{(\beta_{Hi} - \beta_{Hib})}{\sqrt{\left(\frac{(S.EHi)^2}{S.EHi}\right) + \left(\frac{(S.EHib)^2}{S.EHib}\right)}}^{1/2}$$

where, $\beta_{Hi}$ and $S.EHi$ represent the unstandardized regression coefficients and the standard errors for the hypothesis i ($i = 1-3$).
Results in Table V showed that all the t-values do not exceed a value of 2.0, as a result, there is no significant difference between the two coefficients (H1.a,b, H2a.b, H3a.b and H3c.d).

The results (Table IV, Table V and Figure 1) show that although there is no significant difference between the two coefficients, the effect of OL on two aspects of innovation is statistically significant and quite large, supporting H1a.b. The effect of OL on innovation
quality ($\beta = 0.566; p < 0.001$) is greater than the effect on innovation speed ($\beta = 0.522; p < 0.001$).

$H2a.b$ related to the positive effect of OL on differentiation and low-cost competitive advantage is also supported. OL has a greater impact on differentiation competitive advantage ($\beta = 0.317; p < 0.001$) than on low-cost competitive advantage ($\beta = 0.189; p < 0.05$).

### Table II.
Descriptive statistics, correlations and average variances extracted from constructs

<table>
<thead>
<tr>
<th>Construct</th>
<th>Mean</th>
<th>SD</th>
<th>OL</th>
<th>IS</th>
<th>IQ</th>
<th>DA</th>
<th>CA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Organizational learning (OL)</td>
<td>3.54</td>
<td>0.47</td>
<td>0.82</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Innovation speed (IS)</td>
<td>3.49</td>
<td>0.56</td>
<td>0.49***</td>
<td>0.83</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Innovation quality (IQ)</td>
<td>3.57</td>
<td>0.61</td>
<td>0.54***</td>
<td>0.63***</td>
<td>0.81</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Differentiation advantage (DA)</td>
<td>3.82</td>
<td>0.56</td>
<td>0.63***</td>
<td>0.58***</td>
<td>0.71***</td>
<td>0.85</td>
<td></td>
</tr>
<tr>
<td>Low-cost advantage (CA)</td>
<td>3.65</td>
<td>0.51</td>
<td>0.53***</td>
<td>0.64***</td>
<td>0.63***</td>
<td>0.62***</td>
<td>0.87</td>
</tr>
</tbody>
</table>

**Notes:** Diagonal elements (in italic) are the square root of the AVE; off-diagonal elements are the correlations among constructs; ***correlation is significant at the 0.001 level.

### Table III.
Overall fit index of the CFA model

<table>
<thead>
<tr>
<th>Fit index</th>
<th>Scores</th>
<th>Recommended threshold value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Absolute fit measures</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CMIN/df</td>
<td>1.636</td>
<td>$\leq 2^a; \leq 5^b$</td>
</tr>
<tr>
<td>GFI</td>
<td>0.913</td>
<td>$\geq 0.90^a; \geq 0.80^b$</td>
</tr>
<tr>
<td>RMSEA</td>
<td>0.048</td>
<td>$\leq 0.8^a; \leq 0.10^b$</td>
</tr>
<tr>
<td><strong>Incremental fit measures</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NFI</td>
<td>0.942</td>
<td>$\geq 0.90^a; \geq 0.80^b$</td>
</tr>
<tr>
<td>AGFI</td>
<td>0.886</td>
<td>$\geq 0.90^a; \geq 0.80^b$</td>
</tr>
<tr>
<td>CFI</td>
<td>0.976</td>
<td>$\geq 0.90^a$</td>
</tr>
<tr>
<td><strong>Parsimonious fit measures</strong></td>
<td></td>
<td>The higher the better</td>
</tr>
<tr>
<td>PGFI</td>
<td>0.695</td>
<td></td>
</tr>
<tr>
<td>PNFI</td>
<td>0.789</td>
<td>The higher the better</td>
</tr>
</tbody>
</table>

**Notes:** $^a$acceptable; $^b$marginally acceptable

### Table IV.
Structural model results

<table>
<thead>
<tr>
<th>Hypothesis</th>
<th>Proposed effect</th>
<th>Estimate</th>
<th>$p$</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>$H1a$: OL $\rightarrow$ IS</td>
<td>+</td>
<td>0.522***</td>
<td>&lt;0.001</td>
<td>Supported</td>
</tr>
<tr>
<td>$H1b$: OL $\rightarrow$ IQ</td>
<td>+</td>
<td>0.566***</td>
<td>&lt;0.001</td>
<td>Supported</td>
</tr>
<tr>
<td>$H2a$: OL $\rightarrow$ DA</td>
<td>+</td>
<td>0.317***</td>
<td>&lt;0.001</td>
<td>Supported</td>
</tr>
<tr>
<td>$H2b$: OL $\rightarrow$ CA</td>
<td>+</td>
<td>0.189**</td>
<td>0.008</td>
<td>Supported</td>
</tr>
<tr>
<td>$H3a$: IS $\rightarrow$ DA</td>
<td>+</td>
<td>0.172**</td>
<td>0.002</td>
<td>Supported</td>
</tr>
<tr>
<td>$H3b$: IS $\rightarrow$ CA</td>
<td>+</td>
<td>0.362***</td>
<td>&lt;0.001</td>
<td>Supported</td>
</tr>
<tr>
<td>$H3c$: IQ $\rightarrow$ DA</td>
<td>+</td>
<td>0.446***</td>
<td>&lt;0.001</td>
<td>Supported</td>
</tr>
<tr>
<td>$H3d$: IQ $\rightarrow$ CA</td>
<td>+</td>
<td>0.333***</td>
<td>&lt;0.001</td>
<td>Supported</td>
</tr>
</tbody>
</table>

**Notes:** ***Significant at the 0.001 level; **significant at the 0.01 level
related to the positive effect of innovation speed and innovation quality on differentiation and low-cost competitive advantage is also supported. Specifically, the influence of innovation speed on low-cost competitive advantage ($\beta = 0.362; p < 0.001$) is more than its effect on differentiation competitive advantage ($\beta = 0.172; p < 0.05$), and the influence of innovation quality on differentiation competitive advantage ($\beta = 0.446; p < 0.001$) is more than that on low-cost competitive advantage ($\beta = 0.333; p < 0.001$).

To provide evidence on the mediating role of aspects of innovation, direct and indirect effects were computed (Table VI). The indirect effects in Table VI first confirm the mediating roles of both innovation speed and innovation quality between OL and competitive advantage.

Further analyses were implemented to verify the magnitude and statistical significance of the indirect effects. For statistical inferences, in accordance with the suggestion of Preacher and Hayes (2008), the bootstrap confidence intervals method was used with 5,000 iterations to test the significance of indirect effects (Table VII).

Table VII shows that the indirect effects of OL on differentiation advantage ($\beta = 0.342; p < 0.001$) and low-cost advantage ($\beta = 0.377; p < 0.001$) are within the confidence intervals. These results confirm the mediating roles of both innovation speed and innovation quality in the relationship between OL and competitive advantage.

Table V. Statistical significance of the difference between hypotheses

<table>
<thead>
<tr>
<th>Hypothesis</th>
<th>Unstandardized regression $\beta$</th>
<th>SE</th>
<th>Standardized $\beta$</th>
<th>t-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>H1a</td>
<td>0.691</td>
<td>0.080</td>
<td>0.522</td>
<td>1.30</td>
</tr>
<tr>
<td>H2a</td>
<td>0.369</td>
<td>0.080</td>
<td>0.317</td>
<td>1.56</td>
</tr>
<tr>
<td>H3a</td>
<td>0.151</td>
<td>0.049</td>
<td>0.172</td>
<td>1.97</td>
</tr>
<tr>
<td>H3c</td>
<td>0.346</td>
<td>0.048</td>
<td>0.446</td>
<td>1.75</td>
</tr>
<tr>
<td>H1b</td>
<td>0.849</td>
<td>0.091</td>
<td>0.566</td>
<td></td>
</tr>
<tr>
<td>H2b</td>
<td>0.198</td>
<td>0.075</td>
<td>0.189</td>
<td></td>
</tr>
<tr>
<td>H3b</td>
<td>0.286</td>
<td>0.048</td>
<td>0.362</td>
<td></td>
</tr>
<tr>
<td>H3d</td>
<td>0.232</td>
<td>0.044</td>
<td>0.333</td>
<td></td>
</tr>
</tbody>
</table>

Notes: $\beta$: regression coefficients; SE: standard errors

Chi-square = 351.575; df = 178; $p = 0.000$; 
Chi-square/$df = 1.975$; 
GFI = 0.895; TLI = 0.957; CFI = 0.963; 
RMSEA = 0.059

Figure 1. Path coefficients of the structural model
5. Discussion and conclusions

Knowledge and innovation are considered core resources enabling firms to provide goods and services with high value and differentiation to customers and sustain competitive advantage (Liao et al., 2007; Chen et al., 2016). However, there can be barriers to increasing both the knowledge capital and innovation capability of a firm. For example, organization members may delay sharing their knowledge, especially key knowledge, due in part to the pursuit of individual benefits; such delays often result in a huge loss of valuable organizational knowledge once employees retire or leave the organization (Ma et al., 2008).

Moreover, Song (2015) argued that, in contrast to Japanese and Korean firms, which have already achieved considerable success in innovation activities, many Chinese firms are still struggling to transform from imitators to innovators. In this context, the hypotheses developed in this article provide important contributions to both practical and theoretical initiatives on innovation and competitive advantage in China.

First, in response to the question of Anderson et al. (2014), “What is the relationship between organizational resources and different types of organizational innovation?”, this study indicates that OL is a strategic capability of an organization that facilitates two types of innovation (innovation speed and innovation quality). This finding highlights the important role of building a learning organization aimed at enhancing innovation speed and innovation quality to create and sustain competitive advantage by:

- promoting activities to gather and share new, relevant knowledge at both the organizational and individual levels;
- strengthening the acquisition and development of critical capacities and skills between/for employees; and
- applying new and useful knowledge in organizational improvements.

<table>
<thead>
<tr>
<th>Predictor/dependent</th>
<th>IS</th>
<th>IQ</th>
<th>DA</th>
<th>CA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Direct effects</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>OL</td>
<td>0.522***</td>
<td>0.566***</td>
<td>0.317***</td>
<td>0.189**</td>
</tr>
<tr>
<td>IS</td>
<td>0.172**</td>
<td>0.362***</td>
<td></td>
<td></td>
</tr>
<tr>
<td>IQ</td>
<td>0.446***</td>
<td>0.333***</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Indirect effects</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>OL</td>
<td>0.342</td>
<td></td>
<td>0.377</td>
<td></td>
</tr>
<tr>
<td>Total effects</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>OL</td>
<td>0.659</td>
<td>0.566</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Notes:** ***Significant at the 0.001 level; **significant at the 0.01 level

<table>
<thead>
<tr>
<th>Path</th>
<th>Direct effects</th>
<th>Indirect effects</th>
<th>Total effects</th>
<th>Bias-corrected confidence intervals</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Lower confidence level</td>
</tr>
<tr>
<td>OL → Innovation → DA</td>
<td>0.317***</td>
<td>0.342***</td>
<td>0.659***</td>
<td>0.263</td>
</tr>
<tr>
<td>OL → Innovation → CA</td>
<td>0.189***</td>
<td>0.377***</td>
<td>0.566***</td>
<td>0.290</td>
</tr>
</tbody>
</table>

**Note:** ***Significant at the 0.001 level
To achieve these goals, leaders/managers should:

- support an entrepreneurial culture, such as a flexible or clan culture (Sanz-Valle et al., 2011), and a learning-oriented culture (Tamayo-Torres et al., 2016) that emphasizes continuous learning;
- focus on creating the core competencies that contribute to improved OL, such as knowledge management capabilities (Liao and Wu, 2010; Imran et al., 2016); and
- introduce resources and activities that stimulate the process of acquiring, sharing and using knowledge, such as technology, training, information dissemination systems, information bulletins, continuous learning, informal discussions and teamwork (Tamayo-Torres et al., 2016).

A second significant contribution of this study is the elaboration of the effects of OL on two innovation aspects (speed and quality) and, in turn, two types of competitive advantage (differentiation and low-cost). This contribution is particularly important for initiatives on innovation and competitive advantage, as innovation speed and innovation quality are the foundation of innovation activities and thus play decisive roles in the success and performance of an organization (Wang et al., 2016). A full understanding of the aspects of innovation will help firms develop effective and diverse solutions and select the most appropriate strategy (differentiation or low-cost). OL and innovation quality have greater impacts than innovation speed on differentiation competitive advantage. By contrast, innovation speed has a greater impact than innovation quality and OL on low-cost competitive advantage. Identifying the relationships among structures provides specific and useful guides for directors/managers to achieve the desired impacts on each type of competitive advantage. The findings imply that pursuing a differentiation strategy should involve a focus on the roles of OL and innovation quality because these capabilities allow firms to provide special and valuable goods and services to customers. In line with this conclusion, Santos-Vijande et al. (2012) reported that OL has greater effects on differentiation competitive strategy than on cost-leadership strategy. Thus, when pursuing a low-cost strategy, firms should focus efforts on innovation speed to create faster responses to the environment by launching new products in less time and with lesser costs, ultimately improving firm performance (Tidd et al., 2005). Improving innovation speed will minimize costs per product unit compared with competitors. Supporting this conclusion, Wang et al. (2016) noted that innovation speed has a significant effect on a firm’s cost management and productivity compared with key competitors.

Third, in response to the call by Tamayo-Torres et al. (2016) for a greater understanding of how OL and innovation contribute to competitive advantage, this paper has investigated the relationships among OL, aspects of innovation and competitive advantage in a model. The empirical findings verified the mediating roles of innovation speed and innovation quality in the relationship between OL and competitive advantage. OL practices will impact differentiation and low-cost competitive advantage directly or indirectly by improving the specific aspects of innovation. The findings offer a much deeper understanding (especially for CEOs/managers) of the factors and pathways required to promote differentiation and/or low-cost competitive advantage. Thus, the findings contribute to the literature on strategic management, which continually focuses on exploring mechanisms, resources and capabilities that facilitate the development of specific aspects of competitive advantage.

This study has some limitations that need to be addressed in future studies. First, this study uses a cross-sectional design, and causal relationships may change in the long term. A longitudinal study would help address this limitation and confirm the result. Second, the
results and benchmarks in this paper were based on an examination of the correlations among the constructs in the context of Chinese firms. Studies are needed in other contexts to provide a clearer picture of the relationships among these constructs. Third, this study only researched the definition, dimensions and consequences of OL in general. Further research should assess OL more deeply on the basis of four processes, namely, information acquisition, knowledge dissemination, shared interpretation and organizational memory (Slater and Narver, 1995; Weerd-Nederhof et al., 2002), and in relation to three levels of both innovation speed and innovation quality, namely, product/service level, process level and enterprise level (Haner, 2002). Different patterns of innovation at each level may reflect different states and results. Fourth, this study did not evaluate the relationships between latent variables when assessing the impact of moderating variables. Therefore, future research may explore more deeply the relationships among latent variables in the research model by adding moderator variables, such as firm size, firm age and type of industry. Finally, although OL capability can create unique competencies among employees (Garvin, 1993) and positively contribute to stimulating innovation and competitive advantage, the antecedents enabling full realization of the potential and power of OL toward the organization’s strategic variables remain to be identified.

Overall, this paper provides a theoretical basis and empirical evidence verifying the hypotheses that OL, innovation speed and innovation quality significantly contribute to a firm’s competitive advantage. OL and innovation quality have more significant effects on firm’s differentiation competitive advantage, whereas innovation speed has more significant effects on low-cost competitive advantage. These findings offer a more concrete understanding of the different ways in which CEOs/managers may better operate their firms to enhance differentiation and/or low-cost competitive advantage through OL and the specific aspects of innovation.

References


Further reading


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