The effects of organizational isomorphism on innovation performance through knowledge search in industrial cluster

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Abstract

Purpose – This paper aims to identify the relationships of both organizational isomorphism and knowledge search with the innovation performance of cluster enterprises. It also specifies the mechanism by which organizational isomorphism affects innovation performance, through knowledge search.

Design/methodology/approach – Firm-level data were collected with questionnaires distributed to cluster enterprises in Zhejiang Province, China, which produced 165 usable responses for the analysis. Both multiple regression analyses and structural equation modelling were used to test the hypotheses.

Findings – Normative isomorphism and mimetic isomorphism have inverse U-shaped effects on the innovation performance of cluster enterprises, as does exploratory knowledge search. Exploitative knowledge search and the balance between two types of knowledge search have positive effects on the innovation performance of cluster enterprises; exploratory and exploitative knowledge searches exert partial mediation effects between the organizational isomorphism and innovation performance of cluster enterprises. The mediating effect of knowledge search transforms the inverse U-shaped effect of normative isomorphism and mimetic isomorphism on innovation performance into a positive effect.

Originality/value – This study provides new insights into the effects of organizational isomorphism on innovation performance by showing the indirect influence of organizational isomorphism in clusters. The study proposes a strategic logic of moderate isomorphism, clarifies the innovative effect of different knowledge search modes and reveals the construction and management mechanisms of organizational isomorphism and knowledge search strategy of firms in clusters.

Keywords Innovation performance, Industrial cluster, Exploratory search, Exploitative search, Organizational isomorphism

Paper type Research paper

1. Introduction

In the past 30 years, with the transformation of China's economy, various industrial clusters also have emerged, including the Zhuji hosiery cluster, Yueqing low-pressure electric appliance cluster, Changshu clothing cluster, Xinxing kitchen utensils and appliances cluster and Dongguan electronic products cluster. The clusters account for much of the domestic and international markets for these products, have powerful influences on the industry and are engines of local economic development. However, many of them also feature disordered, homogeneous competition and lack technological innovation capacities,

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which hinders their efforts to upgrade and improve. A notable limitation on cluster development is the gap in terms of firms' innovation ability. However, an industrial cluster needs to function as an innovation network featuring learning, continuous innovation and collaborations by actors involved in multilateral trading. Through their constant interactions and learning processes, cluster firms gain an ability to adjust their behaviours in response to changes in the environment; they also encourage the spread of innovations, constant updates to technology and adjustments to the innovative environment itself. Therefore, exploring the formation of and mechanisms underlying innovation performance by cluster enterprises constitutes an important research area for cluster theory.

A general claim asserts that geographical proximity facilitates knowledge sharing and, thus, interactive learning and innovation. The idea is that knowledge externalities in a district are "in the air", available to firms in the area. However, local knowledge networks are also unevenly distributed (Boschma and Wal, 2006). Knowledge diffusion is heterogeneous and dependent on the ability of each individual firm to leverage the knowledge dissemination system available in its district (Giuliani, 2005). For example, some firms may find it fairly easy to obtain technology knowledge available in their local areas, such that they acquire production technology and methods at a glance. Others instead find it difficult to mimic certain knowledge and skills and can access innovation methods and means only by exerting significant effort. In-depth analyses of firm-level characteristics may reveal how knowledge search arises and spreads within the cluster, as well as clarify the relationship between such knowledge searches and competitive advantages. In particular, organizational isomorphism at the firm level likely affects knowledge searches and thus impacts a firm's innovation performance.

According to institutional theory, an institutional environment has the power to cause organizations within it to perceive similar rules, norms and cognitive and cultural pressures, such that they act in similar ways to earn recognition and approval and to increase their legitimacy. In turn, they can receive the support and resources they need for their own survival. Thus, homogeneity forms gradually. Cluster enterprises, which by definition are in the same area and face similar circumstances, try to change their resource occupancy status for survival. To compete, small firms tend to imitate larger ones, new enterprises learn from old enterprises and cluster firms share technical innovations and profits. Therefore, to obtain legitimacy and survive in a cluster, firms gradually become isomorphic, through coercive, mimetic and normative institutional mechanisms. In other words, isomorphism may be a necessary strategic choice process for cluster enterprises.

Previous research also notes that, when an organization leans towards isomorphism, it suffers a negative influence on its performance because organizational differentiation provides competitive advantages (Scott, 1987; Kondra and Hinings, 1998; Oliver, 1991). However, in an uncertain industrial environment, organizations that adopt adaptive, obedient attitudes to mediate the stress caused by the environment achieve legitimacy to survive. In the resulting gradual process of organizational isomorphism, uncertainty decreases, which may lessen the risk of firm failure. It also enables firms to study and accumulate knowledge and technology quickly, which may increase their own innovation abilities (Mathews, 2002; Hausman, 2005; Shiller, 2005; Hargrave and Van de Ven, 2006; Salmeron and Bueno, 2006).

Overall, prior research lacks any clear consensus about the relationship between organizational isomorphism and firms' innovation performance. Does organizational isomorphism by cluster enterprises affect their innovation performance? Is the effect linear or curvilinear? Do different knowledge search methods have similar effects on innovation performance? How does organizational isomorphism influence innovation

performance through knowledge search? These questions have not been adequately addressed; in response, this study takes cluster enterprises as the research objects and details the influence of their organizational isomorphism on their innovation performance, as well as how knowledge search mediates this influence. This article details the construction and management mechanisms related to cluster enterprises' organizational isomorphism and knowledge search strategies, as Figure 1 indicates. Section 2 contains the conceptual framework and study hypotheses; Section 3 presents the sample, data and measures. The results in Section 4 lead into the conclusions presented in Section 5.

2. Theoretical framework and hypotheses

2.1 Organizational isomorphism

Organizational isomorphism refers to "the constraining process that forces one unit in a population to resemble other units that face the same set of environmental conditions" (DiMaggio and Powell, 1983). Many scholars discuss this phenomenon (Messner *et al.*, 2008; Carolan, 2008; DiMaggio and Powell, 1983; Scott, 1987; Fuentes, 2014). According to population ecology theory, an environment exerts absolute power over the community, so when biological communities face similar environmental restrictions and pressure, for example, they adopt similar means to live, such that eventually they achieve the same form (Hannan and Freeman, 1986). According to institutional theory, isomorphism among organizations is beneficial not mainly as a means to enhance competitiveness or increase operating efficiency but rather as a form of access to the legitimacy to survive and consolidation of survival opportunities (Scott, 1987; Xinxian, 2000). DiMaggio and Powell (1983) propose three types of isomorphism caused by a powerful institutional environment: coercive, mimetic and normative. Most studies highlight one or two types; for example, Dacin (1997) merges coercive and normative isomorphism to propose that rules or norms can emerge as cultural theories, ideologies or prescriptions about how society works or should work. Institutionalized cultural rules define the meaning and identity of each individual and the appropriate patterns of economic, political and cultural activity (Dacin, 1997). In line with Dacin (1997), the current study combines coercive and normative isomorphism, then splits organizational isomorphism according to the market and non-market forces on it, as normative or mimetic isomorphism. Specifically, normative isomorphism stems from formal and informal pressures exerted on organizations by other organizations on which the focal firm depends, including cultural expectations in the society and

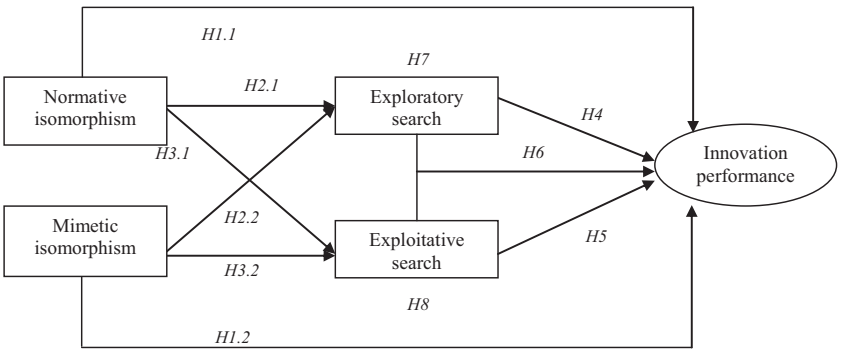

Figure 1.
Research framework.

professionalization trends that define the conditions and methods of work. The latter trends control the "production of producers" and attempt to establish a cognitive base or legitimacy for occupational autonomy (DiMaggio and Powell, 1983; Xinxian, 2000). Mimetic isomorphism instead implies emulation of other organizations. If a focal organization lacks a strong understanding of technology, has ambiguous goals or functions in an environment marked by symbolic uncertainty, it might model itself on other organizations. Through this form of isomorphism, the organization learns to imitate the form or behaviour of successful examples in the pursuit of legitimacy (DiMaggio and Powell, 1983; Dacin, 1997).

2.2 Knowledge search

As a problem-solving process, search entails the creation and recombination of technological ideas and new knowledge (Katila and Chen, 2009; March, 1991). An organization's search capability enables it to gather and store information and then convert it into knowledge that can stimulate firm innovation (Berends and Lammers, 2010; Kim and Rhee, 2009). According to prior research (Stuart and Podolny, 1996; Koput, 1997; Katila, 2002; Katila and Ahuja, 2002; Mahdi, 2003; Laursen and Salter, 2006), knowledge search refers not simply to the activity or process of seeking and acquiring knowledge but also spans the generalized concept that includes knowledge-seeking, acquisition, integration and use. In the knowledge economy, search is vital to firm innovation.

Clusters constitute a form of knowledge networks, and knowledge search is an essential activity of network members. Previous studies offer multiple classifications of knowledge search dimensions, including local versus distant search (Levinthal, 1997; Phelps, 2010; Suzuki and Methé, 2014), exploratory versus exploitative search (Katila and Chen, 2009; March, 1991), search depth versus search scope (Katila and Ahuja, 2002; Laursen and Salter, 2006) and local versus boundary-spanning search (Rosenkopf and Nerkar, 2001). Across the varying classifications, the underlying issue remains the challenge to organizations that need to leverage their familiar, existing knowledge while also finding and exploring new knowledge. As March (1991) summarizes, the distinction between the "exploration of new possibilities" and the "exploitation of old certainties" captures fundamental differences in firm behaviour and strategy, with significant consequences for firm performance. Therefore, the current study considers two knowledge search modes: exploratory and exploitative (Katila and Chen, 2009; March, 1991). Exploratory knowledge search pursues new knowledge or attempts to find new combinations of knowledge; exploitative knowledge search instead reconstructs familiar knowledge or improves currently used knowledge combinations.

2.3 Organizational isomorphism and innovation performance

Organizational isomorphism can exert a positive effect on innovation performance. With a case analysis, Inzelt (1996) shows that organizational isomorphism exerts positive effects on technology, product and process innovation. Using in-depth interviews with members of small US and Spanish enterprises, Hausman (2005) reveals that organizational isomorphism has positive effects on their development and innovation. Salmeron and Bueno (2006) also find that organizational isomorphism improves the institutional diffusion of information technology, and Benders *et al.* (2006) suggest that the power of the institutional environment can promote the development of the whole industry while also improving firms' innovation ability. When resources, institutional norms, professional leading power and successful examples in the external environment arise, organizations seeking legitimacy in the network system will exhibit learning and imitation behaviour, as they engage in innovation and

development of their own products, process, technology and management (Inzelt, 1996; Liao, 1996). However, some scholars note that institutional pressure produces no significant improvement on firms' innovation performance because organizational isomorphism can conflict with the innovation activities and organizational development of enterprises (Scott, 1987; Kondra and Hinings, 1998; Oliver, 1991). When the degree of isomorphism is too high, firms may suffer organizational inertia, unable to respond quickly to changes in the environment, with negative effects on their innovation performance (Scott, 1987; Kondra and Hinings, 1998; Oliver, 1991).

That is, organizational isomorphism might help firms imitate and learn from other network members, which reduces their risk of failure and likely improves their innovation performance. Yet, if the degree of isomorphism surpasses a critical threshold, the organization is likely to experience inertia and rising homogeneity, which results in diminished innovation performance. Therefore, the current research predicts that organizational isomorphism has a non-linear, inverse U-shaped effect on firm innovation performance.

H1. Organizational isomorphism of cluster enterprises exerts an inverse U-shaped effect on innovation performance.

H1a. Normative isomorphism of cluster enterprises exerts an inverse U-shaped effect on innovation performance.

H1b. Mimetic isomorphism of cluster enterprises exerts an inverse U-shaped effect on innovation performance.

2.4 Organizational isomorphism and knowledge search

2.4.1 Organizational isomorphism and exploratory knowledge search. When an organization functions in a dynamic, uncertain environment, innovation knowledge from inside and outside the industry can help the organization perform special tasks or non-structural events (Jackson, 1992; Hambrick and Chen, 1996). Therefore, cluster enterprises are more willing to conduct exploratory searches. In addition, if a few core members with dominant power in the industrial network accept heterogeneous knowledge from outside the industry, they may require partners to cooperate (Abrahamson and Rosenkopf, 1993). The existing social and cultural situation and resource dependence relationship also leads most network members to assume that the innovation knowledge will help improve their firm efficiency, so they likely are willing to accept innovative knowledge from core members (Hambrick and Chen, 1996). Thus, the integrated effect of internal and external forces can lead to a high degree of exploratory knowledge diffusion in the cluster system.

H2. Organizational isomorphism of cluster enterprises exerts a positive effect on exploratory knowledge search.

H2a. Normative isomorphism of cluster enterprises exerts a positive effect on exploratory knowledge search.

H2b. Mimetic isomorphism of cluster enterprises exerts a positive effect on exploratory knowledge search.

2.4.2 Organizational isomorphism and exploitative knowledge search. Organizational isomorphism results from imitating other organizations in adapting to the environment, and learning from such imitation mainly depends on the communication and transmission of

information and knowledge (Haunschild and Miner, 1997). When enterprise members in an industrial network recognize their own poor operational performance or find themselves unable to maintain cooperation with other members, rather than seek help from other, heterogeneous organizations, they might be inclined to use their existing relationships within the network system to consult and learn from the same or similar enterprise members (Brown and Eisenhardt, 1997). To reduce the risk created by new strategic orientations, firms seek homogeneous knowledge, which can be more beneficial for their future performance (McDonald and Westphal, 2003). As a result of this organizational isomorphism, firms might be more ready and willing to acquire homogeneous knowledge within the system.

H3. Organizational isomorphism of cluster enterprises exerts a positive effect on exploitative knowledge search.

H3a. Normative isomorphism of cluster enterprises exerts a positive effect on exploitative knowledge search.

H3b. Mimetic isomorphism of cluster enterprises exerts a positive effect on exploitative knowledge search.

2.5 Knowledge search and innovation performance

2.5.1 Exploratory knowledge search and innovation performance. Exploratory search is a key influence on the generation of innovative ideas and the discovery of breakthrough solutions (Ahuja and Lampert, 2001; Kim and Park, 2013). Diversified knowledge is conducive to the success of firm innovation and also enhances its competitive advantage (Leiponen and Helfat, 2010). Moreover, empirical research shows that exploratory knowledge search has a positive influence on the firm's innovation performance (Rosenkopf and Nerkar, 2001; Wei-Long *et al.*, 2012; Katila and Ahuja, 2002). However, expanding the search scope excessively may increase knowledge integration costs, decentralize the firm's attention or reduce its innovation performance (Patel and Have, 2010). Some empirical studies in different countries and industries also assert that exploratory searches by cluster enter-prises exert inverse U-shaped effects on innovation performance (Laursen and Salter, 2006; Ahuja and Lampert, 2010; Patel and Have, 2010).

H4. Exploratory knowledge search by cluster enterprises has an inverse U-shaped effect on their innovation performance.

2.5.2 Exploitative knowledge search and innovation performance. With an exploitative knowledge search, firms expand and optimize original knowledge, which leads them to study widely and develop new skills (Makadok and Walker, 1996) and enables them to adapt better to environmental changes (Katila, 2002; Laursen and Salter, 2004). Exploitative search offers the advantages of low risk and low cost, and repeated searches across existing knowledge can make the firm more professional and also promote incremental innovation (Rosenkopf and Nerkar, 2001). Some empirical studies suggest exploitative knowledge search has a positive influence on innovation performance (Phene *et al.*, 2006; Nerkar, 2003), but others note that it cannot lead to knowledge diversity (Rosenkopf and Nerkar, 2001). Much of the knowledge required to support innovation must be obtained outside the organization or from other technical fields (Chesbrough, 2003), so an excessive reliance on exploitative search may result in "core rigidity" (Leonard Barton, 1992) and competency traps (Levinthal and March, 1993). These outcomes hinder innovation and can even be fatal for the enterprise (March, 1991).

H5. Exploitative knowledge search by cluster enterprises has an inverse U-shaped effect on their innovation performance.

2.5.3 Balance of exploratory and exploitative search and innovation performance. In light of the complementary benefits of exploration and exploitation, scholars suggest that an appropriate balance between these types of search may be necessary for firm survival and prosperity (March, 1991; Rivkin and Siggelkow, 2003; Lavie *et al.*, 2010), especially because the two forms must compete for scarce resources (March, 1991). According to Levinthal and March (1993), "The basic problem confronting an organization is to engage in sufficient exploitation to ensure its current viability and, at the same time, to devote enough energy to exploration to ensure its future viability". Organizations that engage in exploitation, to the exclusion of exploration, become trapped in a suboptimal equilibrium (Levinthal and March, 1993) that makes adaptation difficult. Organizations that explore, to the exclusion of exploitation, suffer the costs of experimentation without gaining the benefits associated with exploiting extant opportunities (March, 1991). Therefore, organizations must balance the conflicting demands for short-term efficiency and long-term effectiveness (March, 1991; Smith and Tushman, 2005; Tushman and O'Reilly, 1996; Venkatraman *et al.*, 2007) to ensure their innovation performance.

H6. The balance between exploratory and exploitative knowledge search has a positive effect on the innovation performance of cluster enterprises.

2.6 Mediating effect of knowledge search

Although organizational isomorphism connotes learning and interaction, innovation performance actually depends primarily on conscious knowledge search behaviours during interaction processes (Singh, 2005). Organizational isomorphism has strong influences on firms' knowledge acquisition and external learning activities. As it develops, organizations collect professional knowledge by referring to institutional norms and rules, which may improve their innovation performance (Singh, 2005; Kee-hung *et al.*, 2006). Combining the preceding discussions of organizational isomorphism, knowledge search and innovation performance, this study predicts the following:

H7. Exploratory knowledge search has a mediating effect between organizational isomorphism and innovation performance of cluster enterprise.

H8. Exploitative knowledge search has a mediating effect between organizational isomorphism and innovation performance of cluster enterprise.

3. Method

3.1 Sample and data collection

This empirical study draws on the population of firms belonging to industrial clusters in Zhejiang Province, China. The sample was selected for several reasons. First, these firms exhibit the distinct features of organizational isomorphism because industrial clusters in Zhejiang province belong to the endogenous industrial clusters, and in these clusters, the scale of most firms is the same, the degree of product differentiation is small and the degree of homogeneity is very obvious. Second, these firms show obvious characteristics of organizational learning and knowledge search because these firms mainly rely on contact relationship with local enterprises to search and acquire knowledge for firm growth and innovation development. Third, the study takes the clusters in Zhejiang Province as the

research object, which can reduce the impact of regional economic and social development level. Choosing a sample of firms located in a relatively homogeneous geographic, cultural, legal and political space enabled us to minimize the impact of the variables that cannot be controlled in empirical research (Adler, 1983).

The study chose general managers, R&D managers, marketing managers and directors of the office of the general manager as respondents. These middle and senior managers acquire large amounts of information from different departments and therefore possess sufficient knowledge to evaluate the different variables of their organizations (Lloréns Montes *et al.*, 2005). Sample data were collected using four methods. First, 112 ques-tionnaires were sent to part-time MBA or EMBA students who are middle or top mana-gement managers in the organizations during their class at the universities. Of the 84 questionnaires that were recovered, 19 questionnaires are invalid and 65 questionnaires are sufficiently complete. Second, an electronic questionnaire was sent to the local Economic and Information Commission, and the local Economic and Information Commission sends 65 electronic questionnaires to local cluster firms. A total of 53 electronic questionnaires were returned, with 11 questionnaires that were invalid and 42 questionnaires that were sufficiently complete. Third, 148 electronic questionnaires are mailed to managers who were introduced by the author's friends and 87 electronic questionnaires were recovered, including 42 questionnaires that were invalid and 45 questionnaires that were sufficiently complete. Fourth, when the author conducted personal interviews with the managers, 15 questionnaires were distributed, and 13 questionnaires were recovered and sufficiently complete. Prior to distributing the questionnaire to the respondents, three experts and scholars were asked to modify the questionnaire. To reduce a possible desirability bias, questionnaires were sent out to managers along with a cover letter introducing the study as well as a strict confidential commitment. From the total of 340 questionnaires that were distributed, 237 were returned, of which 165 questionnaires were valid. The overall firm-level effective response rate was 48.5 per cent.

According to the results of the descriptive statistical analysis, most of the sample represents small and medium enterprises. For example, the 42 firms with 100-500 employees constitute 25.5 per cent of all responses, and firms with fewer than 100 employees account for 31.5 per cent. Furthermore, firms that have been in existence for 10-20 years are abundant: numbering a total of 71, these firms account for 43 per cent of the sample. Meanwhile, the 46 firms younger than 5 years constitute 27.9 per cent of the sample. In terms of annual sales, a large majority (72.7 per cent) earn less than 1 billion Yuan. The industry distribution of the final sample is as follows: mechanics and engineering industry (n = 29), electronics and information industry (n = 52), chemical and pharmaceutical industry (n = 30), textile industry (n = 38) and other industries (n = 16, including goods, clothing and others).

3.2 Variables and measurements

The research measures reflected an in-depth review of organizational isomorphism, knowledge search and related literatures, as well as discussions with industry practitioners. The questionnaire items for all dependent and independent variables featured seven-point scales, anchored by 1 = "not at all" and 7 = "to a very great extent".

3.2.1 Organizational isomorphism. The organizational isomorphism measure comes from research by DiMaggio and Powell (1983), Deephouse (1996), Xinxian (2000) and Lu (2002). The normative isomorphism measure includes policy and regulation, industry standards, power relations and specialization power, assessed with six items:

(1) The operation of our firm is influenced by the relevant policies and regulations of the government.
(2) The restriction strength among peers makes the operation mode of our firm abide by industry regulations.
(3) The development process of our firm would be affected by the requirements of important customers or suppliers.
(4) The practitioners in the industry have similar education background and working experience.
(5) Our firm is willing to participate in technical cooperation to obtain new business knowledge and technology.
(6) Our firm is willing to obtain new business knowledge and technology through the cooperation with university, research institute and government.

For mimetic isomorphism, three aspects, frequency-based imitation, trait-based imitation and outcome-based imitation, are measured using the following four items:

(1) The practitioners of the industry often mimic each other.
(2) Our firm often mimics the benchmarking enterprises in the industry.
(3) Our firm often mimics the innovative behaviour of other enterprises in the industry.
(4) Our firm and other members of the industry often have more consistent market reaction behaviours.

3.2.2 Knowledge search. The knowledge search scale comes from related research by Chaohui (2008) and He and Wong (2004). Each aspect of exploratory search and exploitative search – seeking, acquisition, integration and utilization of knowledge – relies on four measurement items. First, the exploratory knowledge search items are as follows:

(1) Our firm can effectively identify, recognize and track the knowledge of a new technology field.
(2) Our firm owns multiple channels to gain knowledge about a new technology field inside and outside the industry.
(3) Our firm can combine the obtained knowledge of a new technology field with its own to form the organization's proprietary assets.
(4) Our firm can apply the obtained knowledge of a new technology field to new product development.

Second, the exploitative knowledge search items are the following:

- Our firm can effectively identify, recognize and track the knowledge of an existing technology field.
- Our firm own multiple channels to gain the knowledge of an existing technology field inside and outside the industry.
- Our firm can combine the obtained knowledge of an existing technology field with its own to form the organization's proprietary assets.
- Our firm can apply the obtained knowledge of an existing technology field to new product development.

3.2.3 Innovation performance. Using the method recommended by Sidhu *et al.* (2007), the innovation performance scale includes the following four items:

(1) Compared with the industry average, our firm has more new products.

(2) Compared with the industry average, our firm has faster speed of new product development.

(3) Compared with the industry average, our firm has a higher success rate of new products into market.

(4) Compared with the industry average, our firm has a higher sales proportion of new products.

3.2.4 Control variables. Several variables may affect innovation performance and knowledge search, so this study includes, as controls, enterprise age, enterprise size, industrial environment and technical cooperation experience. The measures of enterprise age and enterprise size both use proxy variables. First, enterprise age appears on a four-point scale (1 = 0-5 years; 2 = 5-10 years; 3 = 10-20 years; 4 = older than 20 years). Second, enterprise size uses a five-point scale (1 = 0-100 employees; 2 = 100-500; 3 = 500-1,000; 4 = 1,000-3,000; 5 = more than 3,000). For technical cooperation experience, this study uses the number of cooperation years the firm had used key technical cooperation methods. The measurement of industrial environment primarily refers to the research of Gatignon and Xuereb (1997), and includes four measurement items:

(1) The update speed of products/services is very fast in the industry.

(2) The speed of technology development and change of products/services is very fast in the industry.

(3) The change speed of the customer requirement is very fast in the industry.

(4) It is difficult to predict the competitor's action in this industry.

3.3 Reliability and validity

We estimated reliability and validity following the guidelines suggested by Anderson and Gerbing (1988). First, we conducted exploratory factor analysis (EFA) by SPSS 18.0. The results showed that the Cronbach's α coefficients of all variables exceed 0.8, in support of the internal consistency of the scales. A principal component analysis also tests for the validity of the measurement scales. The results showed that the KMO values of all variables were greater than 0.70. Bartlett's test of sphericity was also significant at $p < 0.001$. Therefore, the data are suitable for factor analysis. However, the factor loading of one indicator for normative isomorphism is less than 0.5, so it was removed to ensure adequate convergent validity. After this deletion, the values of the KMO, average variance explained and Cronbach's α for normative isomorphism all improved, and all other factor loadings remained greater than 0.7. Finally, the cumulative variance explained by all indicators exceeds 64 per cent, which satisfies the standard that common indicators should explain at least 30 per cent of the variance in variables.

Second, we conducted confirmatory factor analysis (CFA) to assess the convergent and discriminant validity by AMOS 21.0. Table I shows the results of measurement analyses, including loadings, composite reliabilities (CR), average variance extracted (AVE) and fit indices. The CFA model results in a reasonable fit to the data (χ^2/df = 1.376, RMSEA = 0.048, TLI = 0.948, CFI = 0.955, IFI = 0.956). CR was calculated using the procedures suggested by Fornell and Larcker (1981). The CR values for the six constructs exceed 0.7,

Construct	Indicators	Factor loading	*t*-value	Cronbach's α	AVE
Normative isomorphism	NI1	0.762	11.078	0.878	0.590
	NI2	0.786	11.593		
	NI3	0.824	12.420		
	NI4	0.752	10.882		
	NI5	0.711	10.057		
Mimetic isomorphism	MI1	0.672	9.283	0.852	0.592
	MI2	0.853	13.000		
	MI3	0.772	11.228		
	MI4	0.771	11.201		
Exploratory search	ERS1	0.666	9.035	0.817	0.529
	ERS2	0.821	12.014		
	ERS3	0.676	9.222		
	ERS4	0.735	10.308		
Exploitative search	EIS1	0.800	11.812	0.843	0.577
	EIS2	0.668	9.207		
	EIS3	0.750	10.776		
	EIS4	0.804	11.894		
Innovation performance	IP1	0.622	8.485	0.815	0.527
	IP2	0.792	11.749		
	IP3	0.678	9.473		
	IP4	0.797	11.839		
Industrial environment	IE1	0.608	8.151	0.855	0.599
	IE2	0.824	12.253		
	IE3	0.854	12.899		
	IE4	0.785	11.431		

Notes: χ^2/df = 1.376, RMSEA = 0.048, TLI = 0.948, CFI = 0.955, IFI = 0.956

Table I.
CFA results

which is the acceptable CR level suggested by Bagozzi and Yi (1988). All item loadings are significant at the 1 per cent significance level, indicating convergent validity (Bagozzi, Yi, and Phillips, 1991). There is discriminant validity when the square root of the AVE for constructs exceeds any respective inter-construct correlations (Fornell and Larcker, 1981). The result showed the square root of the AVE for all variables exceeded the intercorrelation, indicating sufficient discriminant validity.

4. Results

4.1 Descriptive statistics and correlation results

Table II contains the descriptive statistics and correlation coefficient matrix for the independent, dependent and control variables. The correlation coefficients between these variables are good. In addition, all variance inflation factors were less than 3.0, well below the threshold of 10. These results indicate that multicollinearity was not a threat to the validity of the findings.

4.2 Hierarchical regression results

We chose both hierarchical regression and structural equation modelling (SEM) to test our hypotheses. Hierarchical regression adds controls, explanatory variables and joint effect terms incrementally to gauge their relative contributions (He and Wong, 2004). In particular, the main hypothesis of the study is the inverted-U relationship, and the existing literatures

Table II.
Descriptive statistics and correlation coefficient

Variables	Mean	SD	1	2	3	4	5	6	7	8
Firm age	2.45	1.06	1							
Firm scale	2.63	1.52	0.512**	1						
Technical cooperation experience	9.38	5.24	0.720**	0.399**	1					
Industrial environment	5.00	0.89	−0.015	0.157*	0.264**	1				
Normative isomorphism	4.53	1.23	0.031	0.155*	0.167*	0.203**	1			
Mimetic isomorphism	4.78	0.91	−0.147	0.158*	0.241**	0.416**	0.364**	1		
Exploratory search	4.42	0.68	−0.190*	−0.053	0.111	0.243**	0.539**	0.533**	1	
Exploitative search	4.79	1.02	−0.046	0.073	0.468**	0.536**	0.416**	0.622**	0.509**	1
Innovation performance	4.62	0.78	−0.116	0.047	0.226**	0.314**	0.648**	0.613**	0.661**	0.652**

Notes: $N = 165$; significance at: ** $p < 0.01$ and * $p < 0.05$ (two-tailed)

for inverted-U relationship test almost always used the method of hierarchical regression analysis.

The results of the regression analysis of organizational isomorphism and innovation performance by cluster enterprises appear in Table III. Model 1 is the benchmark model, reflecting the regression between the control variables and the innovation performance of cluster enterprises. Model 2 includes regressions of the control variables, organizational isomorphism and innovation performance. Finally, Model 3 adds the quadratic component of normative isomorphism and mimetic isomorphism, to test for the predicted inverse U-shaped effect.

The regression results of Model 2 demonstrate that both normative isomorphism and mimetic isomorphism have significantly positive effects on the innovation performance of cluster enterprises, with regression coefficients of 0.469 and 0.349, respectively. Adding the quadratic components in Model 3 leads to regression coefficients of 0.392 for normative isomorphism and 0.266 for mimetic isomorphism; the values for their quadratic components are −0.166 and −0.114, respectively, and both reach statistical significance. The *F*-values of Models 2 and 3 both achieve significance. A comparison of the explanatory power of these models indicates that adding the quadratic component of organizational isomorphism increases the value of the adjusted *R*-square from 0.600 to 0.625. Both normative isomorphism and mimetic isomorphism have inverse U-shaped effects on the innovation performance of cluster enterprises, in support of *H1a* and *H1b*.

Table IV contains the results of the regression analysis between organizational isomorphism and knowledge search. Model 4 includes the regression between the control variables and exploratory knowledge search, whereas Model 5 adds normative isomorphism and mimetic isomorphism. According to these regression results, both normative isomorphism and mimetic isomorphism have significant, positive effects on exploratory knowledge search, with regression coefficients of 0.418 and 0.335, respectively, in support of *H2a* and *H2b*. Model 6 reflects the regression between the control variables and exploitative knowledge search, and Model 7 adds normative isomorphism and mimetic isomorphism. Again, both forms of isomorphism have significantly positive effects on exploitative knowledge search, with regression coefficients of 0.196 and 0.231, in support of *H3a* and *H3b*, respectively.

The regression analysis results between knowledge search and innovation performance appear in Models 8-10 in Table III. Model 8 is the regression with the control variables, knowledge search and innovation performance. Both exploratory knowledge search and exploitative knowledge search have significantly positive effects on innovation

Table III. The regression of organizational isomorphism, knowledge search and innovation performance

Variable	Model 1	Model 2	Model 3	Model 8	Model 9	Model 10	Model 11	Model 12
Firm age	−0.558***	−0.216*	−0.201*	−0.010	0.034	0.022	−0.165	−0.071
Firm scale	0.089	−0.072	−0.075	0.068	0.027	0.019	−0.049	−0.059
Technical cooperation experience	0.554***	0.240**	0.245**	−0.052	−0.104	−0.091	0.211*	0.053
Industrial environment	0.145	0.013	0.011	−0.042	−0.059	−0.065	0.014	−0.049
Normative isomorphism		0.496***	0.392***				0.338***	0.362***
Mimetic isomorphism		0.349***	0.266***				0.215**	0.220**
Square of normative isomorphism			−0.166*				−0.114	−0.127
Square of mimetic isomorphism			−0.114*				−0.099	−0.092
Exploratory search				0.440***	0.388***	0.382***	0.203**	
Exploitative search				0.469***	0.547***	0.557***		0.276**
Square of exploratory search					−0.212***	−0.219***		
Square of exploitative search					0.190**	0.153*		
Exploratory search–exploitative search						0.134*		
Adjusted R^2	0.221	0.600	0.625	0.560	0.600	0.615	0.644	0.647
F value	12.604	42.083	35.174	35.750	31.806	30.080	33.963	34.335
DW	1.755	1.705	1.704	1.926	1.874	1.894	1.705	1.745

Notes: $N = 165$; Significance at: *** $p < 0.001$, ** $p < 0.01$ and * $p < 0.05$

performance, with respective regression coefficients of 0.440 and 0.469. Model 9 adds the quadratic component; the regression coefficients of exploratory and exploitative knowledge search are, respectively, 0.388 and 0.547, and the regression coefficients of their quadratic components are −0.212 and 0.190. Although the adjusted *R*-square value increases from 0.560 to 0.600, the quadratic component of exploitative search continues to have a positive effect on innovation performance, so *H4* is supported, but *H5* is not. That is, exploratory knowledge search exerts an inverse U-shaped effect on innovation performance, whereas exploitative knowledge search exerts solely a positive effect. Next, Model 10 adds the absolute difference between exploratory and exploitative search, to reflect their balance. These regression results indicate that this balance has significantly positive effects on innovation performance, with a regression coefficient of 0.134. Thus, *H6* is supported.

Finally, the test of the mediating effect of knowledge search (Table III) requires adding this variable to exploratory search (Model 11) and exploitative search (Model 12). The regression results of Model 11 indicate that after adding the mediating variable exploratory search, exploratory search has significantly positive effects on innovation performance. Normative isomorphism and mimetic isomorphism also still have significantly positive effects on innovation performance, but the regression coefficients decrease, from 0.392 and 0.266 in Model 3 to 0.338 and 0.215. The quadratic components of normative isomorphism and mimetic isomorphism also have no significantly positive effect on innovation performance. The previous findings already showed that exploratory search partially mediates the links of normative isomorphism and mimetic isomorphism with innovation performance. Due to this effect, the inverse U-shaped effects of normative isomorphism and mimetic isomorphism on innovation performance become positive, in partial support of *H7*. Similarly, the regression results of Model 12 show that exploitative search partially mediates the links of normative isomorphism and mimetic isomorphism with innovation performance, in partial support of *H8*.

4.3 Structural equation modelling results

SEM can be used to estimate measurement model and structural model of constructs at the same time, which can solve the problem of measurement error of the latent variable, resulting in making a more accurate estimation of the mediating effect (Taylor *et al.*, 2008).

AMOS 23.0 was used to test the structural model. SEM estimates were generated using the maximum likelihood estimation method (Holbert and Stephenson, 2003; Efron, 2000). Bootstrap program was used to test the significance of mediating effect. First, we adopted a

Variable	Exploratory search		Exploitative search	
	Model 4	Model 5	Model 6	Model 7
Firm age	−0.519***	−0.202	−0.684***	−0.485***
Firm scale	0.016	−0.130	0.030	−0.056
Technical cooperation experience	0.448***	0.160	0.871***	0.693***
Industrial environment	0.114	−0.006	0.291***	0.219***
Normative isomorphism		0.418***		0.196***
Mimetic isomorphism		0.335***		0.231***
Adjusted R^2	0.155	0.445	0.587	0.673
F value	8.500	22.930	59.267	57.161
DW	1.611	1.831	1.861	2.026

Notes: $N = 165$; significance at: *** $p < 0.001$

Table IV.
The regression of organizational isomorphism and knowledge search

repeated random sampling method to extract 1000 bootstrap samples from the original data (n = 165) and then fit model according to the samples. It can generate and store 1,000 estimate values of mediating effect and form an approximate sampling distribution. Second, we calculated the path value of mediating effect and ranked these effect values. Third, we estimated 95 per cent confidence interval (CI) of mediating effect. If the 95 per cent CI of these path coefficients does not include 0, the mediating effect is significant, and the results are shown in Figure 2 and Table V. From Table V, we can see that the indirect effects of the various paths in the 95 per cent CI do not include 0, so it proves that exploratory and exploitative knowledge search exert mediating effects between organizational isomorphism and innovation performance of cluster enterprises. The goodness-of-fit statistics indicate an acceptable model fit (χ^2/df = 1.336, RMSEA = 0.045, TLI = 0.957, CFI = 0.963, IFI = 0.963).

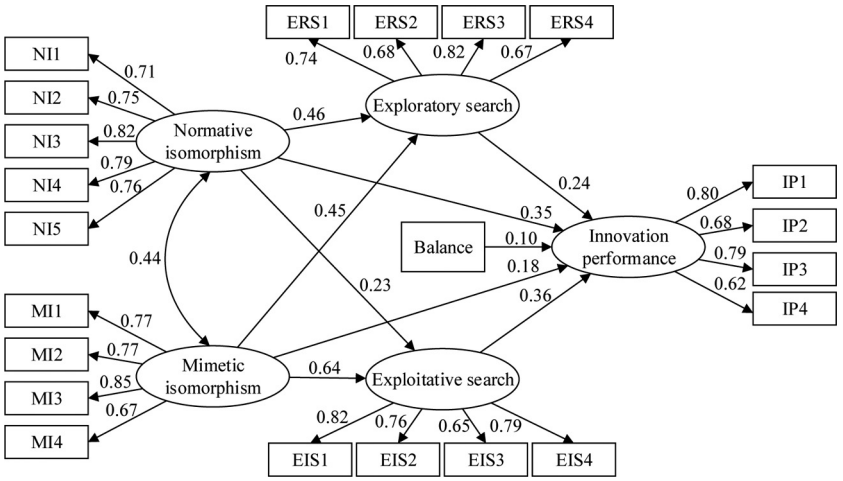

Figure 2.
SEM results

Path	Standardized effects	95% CI Lower	95% CI Upper
Total effects			
Mimetic isomorphism → Innovation performance	0.518	0.360	0.654
Normative isomorphism → Innovation performance	0.54 1	0.388	0.689
Indirect effects			
Mimetic isomorphism → Innovation performance	0.342	0.156	0.533
Mimetic isomorphism → Exploitative search → Innovation performance	0.638 × 0.364 = 0.232	0.074	0.355
Mimetic isomorphism → Exploratory search → Innovation performance	0.454 × 0.241 = 0.109	0.016	0.197
Normative isomorphism → Innovation performance	0.192	0.076	0.344
Normative isomorphism → Exploitative search → Innovation performance	0.227 × 0.364 = 0.083	0.008	0.081
Normative isomorphism → Exploratory search → Innovation performance	0.456 × 0.241 = 0.11	0.009	0.103

Table V.
Test of the mediating effect

5. Discussion and conclusion

5.1 Main findings

5.1.1 Influence of organizational isomorphism on innovation performance. Both normative isomorphism and mimetic isomorphism exert inverse U-shaped effects on innovation performance. As industrial clusters develop, the influence of the institutional environment on firms is highly significant; it causes organizations to move towards gradual isomorphism through constant interactions, imitation and learning. In this process, close cooperation among cluster enterprises also facilitates improved innovation performance. However, with greater isomorphism among cluster enterprises, organizations may suffer learning obstacles due to inertia and may eventually lose their differentiation. When the institutional environment changes, they lack sufficient elasticity to respond. Organizational isomorphism thus exerts a positive influence on the innovation performance of enterprises, but excessive organizational isomorphism may weaken innovation performance.

5.1.2 Influence of knowledge search on innovation performance. First, exploratory knowledge search exerts an inverse U-shaped effect on innovation performance. It enables firms to access a wider range of heterogeneous knowledge and improves their creativity, while also enriching their innovative scope. However, if firms enlarge their search range, they incur higher knowledge integration costs, must decentralize their attention and thus may exhibit poorer innovation performance. As Nemet and Johnson (2012) explain, integrating knowledge from outside the industry is difficult, so such processes involve some inherent risk. Because such cross-industry knowledge is also difficult to absorb, excessive exploratory search is not conducive to innovation performance. Second, exploitative search has a consistently positive effect on innovation performance. It reduces the likelihood of innovation failure, strengthens beliefs in innovation success, promotes the formation of innovation practices, optimizes innovation processes and improves innovation ability. The specific context and firm relationships in a cluster suggest that exploitative search by cluster enterprises is a common activity. Through mutual learning, communication and knowledge dissemination, firms in the cluster network enjoy deep, detailed knowledge transfers and thus improved innovation performance. Third, the balance between exploratory and exploitative search has significantly positive effects on the innovation performance of cluster enterprises, consistent with the empirical results of He and Wong (2004). Exploratory and exploitative search have different profit and risk characteristics, so their organizational structure, innovation process, resource investment and other features also differ. Tension between the two types of knowledge search is obvious, and firms cannot simultaneously leverage the potential of both. Instead, firms must find a balance between them. In particular, firms should carefully allocate attention and resources to exploratory and exploitative search, according to their external environment and internal demands, to promote their own innovation performance.

5.1.3 Mediating effect of knowledge search. Exploratory and exploitative knowledge search both partially mediate the link between organizational isomorphism and innovation performance. Organizational isomorphism can directly influence innovation performance by cluster enterprises; it also can affect this innovation performance through exploratory and exploitative knowledge search. According to the empirical results of this study, when normative isomorphism and mimetic isomorphism have inverse U-shaped effects on innovation performance, due to the mediating influence of exploratory and exploitative knowledge search, the ultimate effects on innovation performance can become positive. If cluster enterprises can leverage the relationships among network members effectively to search and access the knowledge needed during the process of isomorphism, they can improve their innovation performance.

5.2 Theoretical contributions

First, this research helps reconcile the contradiction between isomorphism and innovation. Adopting an attitude of obedience towards group norms is not a negative behaviour; through organizational isomorphism, organizations quickly obtain the knowledge and resources they need to construct their innovation ability. This study thus suggests a dynamic relationship among network members that can be cooperative and competitive in turn. The research findings reinforce institutional theory and help explain the integrity of the industrial order.

Second, the empirical results support the strategic logic of moderate isomorphism: It lessens the risk of failure in uncertain environments while also improving cluster enterprises' innovation ability through knowledge sharing and communication mechanisms resulting from organizational isomorphism.

Third, this research clarifies the innovative effect of different knowledge search modes. Knowledge search consists of two modes: exploratory and exploitative. Both modes influence innovation performance, as does their balance. Furthermore, they serve a mediating role between organizational isomorphism and innovation performance. Therefore, this research enriches organizational learning theory by providing a more robust explanation of the innovation effects of different knowledge search modes.

5.3 Managerial implications

Cluster enterprises should establish strategic thinking focused "with the dissimilation". The organizational isomorphism phenomenon is common in industrial clusters. It can increase the legitimacy of cluster enterprises within an existing system and lessen the risk of failure; cluster enterprises also can accelerate the communication of knowledge across network members through organizational isomorphism processes, which should improve their innovation performance. However, blindly imitating and obeying external institutional norms also can create organizational inertia and hinder innovation. Therefore, organizations should pursue "moderate" isomorphism, and cluster enterprises need to consider institutional specifications and imitation learning while still retaining their flexibility, elasticity and creativity; developing exclusive firm assets; and enhancing their innovation ability.

In particular, cluster enterprises should construct knowledge search management systems. They need to strengthen their exploitative knowledge search capacity and seek the homogeneous knowledge of other network members in the industry to help improve their innovation performance. Such assimilation has minimal risks and costs, and it can improve confidence in the firm's innovations. Furthermore, cluster enterprises should seek to achieve a moderate level of exploratory knowledge search, so that they can introduce new knowledge and technology to grasp innovation opportunities and improve their innovation performance. An excessive search for new internal or external knowledge will affect firm development though. The roles, effects and operations of exploratory and exploitative search differ, so firms must find a balance between them. According to existing research, firms might use four fundamental methods to cope with the conflicting demands for exploratory and exploitative search: contextual ambidexterity (no separation), organizational separation, temporal separation and domain separation (Lavie *et al.*, 2010). These approaches for maintaining balance likely can improve the outcomes in terms of firm innovation.

5.4 Limitations and directions for research

Several limitations of this study must be considered when interpreting the findings. First, focusing on one single region may provide us with some advantages; studying one single region could also introduce bias into the conclusions, thus limiting potential generalizations to

other contexts. Thus, the generalization of the conclusions should be further verified in future research. Second, the cross-sectional data make it difficult to affirm the causal relationships of organizational isomorphism, knowledge search and innovation performance. Further studies could use time-series data to uncover the dynamics of these causal relationships and verify the current research results. They also might investigate the causes and action mechanisms of organizational isomorphism, knowledge search and innovation performance. Finally, researchers should include more moderating variables in these relationships and clarify the influence of the interaction of the two knowledge search modes on innovation performance.

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