Journal of Business Research 64 (2011) 408–417

Contents lists available at ScienceDirect

Journal of Business Research

Innovation, organizational learning, and performance

Daniel Jiménez-Jiménez *, Raquel Sanz-Valle

Universidad de Murcia, Murcia, Spain

ARTICLE INFO

Article history:
Received 1 November 2007
Received in revised form 1 August 2008
Accepted 17 September 2010
Available online 8 October 2010

Keywords:
Innovation
Organizational learning
Performance
SEM

ABSTRACT

Literature examines the relationship between innovation and performance and asserts a positive relationship between organizational learning and both performance and innovation. However, few empirical studies analyze these relationships together. This article explores those relationships using SEM with data from 451 Spanish firms. The findings show that both variables — organizational learning and innovation — contribute positively to business performance, and that organizational learning affects innovation. Another finding of this study is that size and age of the firm, industry and environmental turbulence moderate these relations.

The literature on management emphasizes the key role that both innovation (Baker and Sinkula, 2002; Balkin et al., 2000; Darroch and McNaugton, 2002; Lyon and Ferrier, 2002; Utterback, 1994; Vrakking, 1990; Wolfe, 1994), and organizational learning (Brockmand and Morgan, 2003; Dodgson, 1993; Fiol and Lyles, 1985; Garvin, 1993; Gnyawali et al., 1997; Nevis et al., 1995; Stata, 1989) play in enhancing a firm's competitive advantage.

Some studies suggest that organizational learning and its output, organizational knowledge, are antecedents of innovation (Baker and Sinkula, 1999; Cohen and Levinthal, 1990; Coombs and Hull, 1998; Darroch and McNaugton, 2002; Hage, 1999; Kogut and Zander, 1992; Leonard-Barton, 1999; Nonaka and Takeuchi, 1995; Nooteboom, 1999; Sørensen and Stuart, 2000; Stata, 1989). The basic assumption is that learning plays a key role in enabling companies to achieve speed and flexibility within the innovation process (Brown and Eisenhard, 1995; Miles and Snow, 1978; Weerd-Nederhof et al., 2002).

Organizational learning, innovation and performance relate positively to each other. However, research that studies the interrelationships between the three concepts simultaneously is still scarce. Previous studies usually focus on the innovativeness of the firm, which is to say, on the degree to which the organizational culture promotes and supports innovation (Keskin, 2006; Lee and Tsai, 2005) or analyzes only one type of innovation, mainly product innovation (Salavou and Lioukas, 2003). Thus, previous research provides a partial explanation only of the phenomenon of innovation.

Similarly, most studies of organizational learning adopt a cultural perspective for measuring this concept. Very few studies (Darroch and McNaugton, 2003; Tippins and Sohi, 2003) analyzes the process of organizational learning. Since culture values are more difficult to change than specific actions, focusing on the process may be more helpful for practitioners. This study attempts to address the weaknesses of the preceding literature and analyzes the relationships between organizational learning, innovation and performance together in a single model. This study focuses on the organizational learning process and uses a complete measure of innovation. In addition, this paper analyzes the likely moderating effect of firm size and age, industry and environmental turbulence on the relationships between organizational learning, innovation and performance.

The article starts with a review of the literature on these topics and a description of the model proposals. Then, the article presents the design of the study to test the model and the findings of this study. In the last section, the article discusses the managerial and academic implications of the study, its limitations and recommendations for future research.

1. Innovation and performance

Literature conceptualizes innovation in a variety of ways in the literature, as a process, and outcome of both (Damanpour and Gopalakrishnan, 1998; Damanpour et al., 1989; Knight, 1967; North et al., 2001; Rogers, 1995; Thompson, 1965; Wolfe, 1994). However, most of the definitions of innovation share the idea that innovation implies the adoption of a new idea or behavior.

Literature also distinguishes different types of innovation. The classification most extended and accepted is the one Damanpour (1991) proposes. He distinguishes between technical and administrative innovations. Whereas technical innovations include a new

* Corresponding author. Departamento de Organizacion de Empresas y Finanzas, Facultad de Economia y Empresa, Universidad de Murcia, Campus de Espinardo, Espinardo, Murcia, CP: 30.100, Spain. Tel.: +34 868 88 79 00; fax: +34 868 88 75 37.
E-mail addresses: danielj@um.es (D. Jiménez-Jiménez), raquel@um.es (R. Sanz-Valle).

0148-2963/$ – see front matter © 2010 Elsevier Inc. All rights reserved.
doi:10.1016/j.jbusres.2010.09.010

process and new products or services, administrative innovations refer to new procedures, policies and organizational forms (Dewar and Dutton, 1986; Evan, 1966; Hage, 1980; Normann, 1971; Tushman and Nadler, 1986; Utterback and Abernathy, 1975).

Since the purpose of this article is to analyze how organizational learning influences the whole innovation activity of the firm, the present study adopts a broad concept of innovation that includes the adoption of any new product, process and administrative innovation.

Innovation helps the company to deal with the turbulence of external environment and, therefore, is one of the key drivers of long-term success in business, particularly in dynamic markets (Baker and Sinkula, 2002; Balkin et al., 2000; Darroch and McNaugton, 2002; Lyon and Ferrier, 2002; Scherer, 1992; Utterback, 1994; Vrakking, 1990; Wolfe, 1994). To survive in Schumpeterian environments organizations must be able to cope with increasing complexity and high-speed change (Brown and Eisenhard, 1995). In these contexts, companies with the capacity to innovate will be able to respond to challenges faster and to exploit new products and market opportunities better than non-innovative companies (Brown and Eisenhard, 1995; Miles and Snow, 1978).

Most of the broad empirical studies on the relation between innovation and performance provide evidence that this relation is positive (Bierly and Chakrabarti, 1996; Brown and Eisenhard, 1995; Caves and Ghemawat, 1992; e.g. Damanpour, 1991; e.g. Damanpour and Evan, 1984; Damanpour et al., 1989; Hansen et al., 1999; Roberts, 1999; Schulz and Jobe, 2001; Thornhill, 2006; Weerawardenaa et al., 2006; Wheelwright and Clark, 1992). However, as Simpson et al. (2006) point out, innovation is an expensive and risky activity, with positive outcomes on firm performances but also with negative outcomes, such as increased exposure to market risk, increased costs, employee dissatisfaction or unwarranted changes. In addition, some studies arrive at conflicting conclusions. For instance, Wright et al. (2005), using a sample of small businesses, find that product innovation does not affect performance in benign environments, but has a positive effect on performance in hostile environments.

Focusing on a sample of US business service firms, Mansury and Love (2008) also find that the presence and extent of service innovation have a positive effect on the growth of a firm but no effect on productivity. Finally, Damanpour et al. (2009) find that adopting a specific type of innovation every year (service, technological process, and administrative) in public service organizations in the UK is detrimental, consistency in adopting the same pattern of types of innovation over the years has no effect, and divergence from the industry norm in adopting types of innovation positively affects performance. These results show that the relationship between innovation and performance is complex and requires more research.

Despite the likely detrimental effects resulting to an innovation orientation and some conflicting evidence, theory and most of the empirical studies suggest a positive relationship between innovative activity and firm performance.

H1. Organizational innovation relates positively to firm performance.

2. Organizational learning and performance

The literature on organizational learning has grown exponentially in recent years (Bontis et al., 2002; Dodgson, 1993; Fiol and Lyles, 1985; Huber, 1991; Nonaka and Takeuchi, 1995; Senge, 1990; Slater and Narver, 1995).

Organizational learning is the process by which the firm develops new knowledge and insights from the common experiences of people in the organization, and has the potential to influence behaviors and improve the firm's capabilities (Fiol and Lyles, 1985; Huber, 1991; Senge, 1990; Slater and Narver, 1995). Following Huber (1991), this process comprises four subprocesses (Baker and Sinkula, 1999; Sinkula, 1994; Slater and Narver, 1995; Weerd-Nederhof et al., 2002). The first is knowledge acquisition, which is the process the company uses for obtaining new information and knowledge. The second is knowledge distribution, the process by which employees share information within the firm. The third is knowledge interpretation, which happens when individuals give meaning and transform information into new common knowledge. Finally, organizational memory, is the process of storing the information and knowledge for future use.

Organizational learning is a basis for gaining a sustainable competitive advantage and a key variable in the enhancement of organizational performance (Brockmand and Morgan, 2003; Dodgson, 1993; Fiol and Lyles, 1985; Garvin, 1993; Gnyawali et al., 1997; Nevis et al., 1995; Stata, 1989). Firms that are able to learn stand a better chance of sensing events and trends in the marketplace (Day, 1994; Sinkula, 1994; Tippins and Sohi, 2003). As a consequence, learning organizations are usually more flexible and faster to respond to new challenges than competitors (Day, 1994; Slater and Narver, 1995), which enables firms to maintain long-term competitive advantages (Dickson, 1996).

Some studies provide evidence of a positive relationship between organizational learning and firm performance. For instance, Baker and Sinkula (1999)find that learning orientation has a direct effect on organizational performance. Other studies, which also use a culture measure of learning, have found similar results (Keskin, 2006; Ussahawanitchakit, 2008). Bontis et al. (2002) also provide evidence of a positive relationship between organizational learning and performance, but they focus on the stocks of learning at three levels: individual, group and organization.

Only a few studies focus on the organizational learning process. Tippins and Sohi (2003) show that the five stages they distinguish within the organizational learning process (information acquisition, information dissemination, shared interpretation, declarative memory and procedural memory) have a positive effect on firm performance. Darroch and McNaugton (2003) provide evidence that the whole process of organizational learning produces better performance. Finally, Zheng et al. (2010) found that knowledge management plays a mediating role in the relationship between organizational culture, structure, strategy, and organizational effectiveness.

In sum, empirical findings are consistent with theory and provide evidence that supports the positive relationship between organizational learning and performance. However, these conclusions are not conclusive, since their samples and measures for both organizational learning and performance are very different. Therefore, more research would be of interest. The second hypothesis takes into account the theoretical arguments and the findings of empirical research.

H2. Organizational learning relates positively to performance.

3. Organizational learning and innovation

The literature does not only suggest a positive effect of organizational learning on performance but also argues that innovation mediates this relation. In particular, some articles suggest that organizational learning allows the company to develop capabilities that enhance innovation and that innovation is what positively affects performance (Baker and Sinkula, 1999, 2002; Han et al., 1998; Hurley and Hult, 1998).

Literature proposes several models for explaining the relationship between organizational learning and innovation (Cohen and Levinthal, 1990; Coombs and Hull, 1998; Hage, 1999; Hall and Andriani, 2003; Kogut and Zander, 1992; Leonard-Barton, 1999; Nonaka, 1991; Nonaka and Takeuchi, 1995; Nooteboom, 1999; Sørensen and Stuart, 2000; Stata, 1989). According to the literature, innovation requires that individuals acquire existing knowledge and that they share this knowledge within the organization.

The acquisition of knowledge depends upon the organization's knowledge base (Salavou and Lioukas, 2003) as well as on the

acquisition of external information and knowledge (Chang and Cho, 2008). The acquisition of knowledge from outside the company depends on the capacity of the firm to absorb new ideas, that is, the firm's ability to understand, assimilate and apply the new external knowledge to commercial ends (Cohen and Levinthal, 1990). Organizational learning enhances the assimilative capacity of the firm.

Innovation also needs the transformation and exploitation of existing knowledge. That requires that employees share information and knowledge. As Nonaka (1994) suggests, innovation occurs when employees share their knowledge with the organization and when this shared knowledge generates new and common insights. In short, organizational learning allows the development, acquisition, transformation and exploitation of new knowledge that enhances organizational innovation.

Although literature conceptually supports the link between organizational learning and innovation, research to date does not provide enough empirical evidence (Darroch and McNaugton, 2002). In addition, conclusions of previous studies are difficult to generalize because of the differences among their main purpose, samples, methodologies and the measures they use.

Some qualitative studies show that organizational learning enhances innovation. For instance, Forrester (2000) finds a positive relationship between organizational learning and innovation when she compares how two different auto manufacturers used teams to provide innovations for cost reduction purposes. Yeung et al. (2007) also find that organizational learning affects innovation in the three manufacturing companies they study.

Some quantitative studies analyze the relationship between organizational learning and innovation too. Again, most of them adopt a cultural approach for measuring organizational learning (Hult et al., 2004; Hurley and Hult, 1998; Keskin, 2006; Lee and Tsai, 2005; Mavondo et al., 2005; Salavou and Lioukas, 2003; Ussahawanitchakit, 2008). Similarly, previous studies usually focus on innovation orientation, that is to say, the extent to which the firm's culture promotes and supports innovation (Hult et al., 2004; Hurley and Hult, 1998; Keskin, 2006; Lee and Tsai, 2005; Ussahawanitchakit, 2008).

Finally, some studies focus on one phase of the organizational learning process or on one type of innovation, mainly product or process innovation. For instance, Yli-Renko et al. (2001) find a positive relationship between knowledge acquisition and product innovation. Weerawardena et al. (2006) show that three types of learning influence innovation intensity. Lastly, Chang, and Cho (2008) find that memory sharing, the use of external information and the utilization of formal procedures for retaining knowledge enhance innovation.

Although the above-mentioned studies focus on different aspects of the relationship between organizational learning and innovation, most find a positive relationship between them.

H3. Organizational learning relates positively to organizational innovation.

4. Moderators in the relationships between organizational learning, innovation and performance

In order to study the relationships between organizational learning, innovation and performance in greater depth, this article analyzes now the likely moderating effect on these relationships of some internal and external variables: firm age, firm size, industry and environmental turbulence. The literature frequently cites these variables as antecedents of innovation and performance and some studies suggest that they can moderate the relationships proposed in the present study.

According to the literature, firm size has a positive effect on performance and also on innovation because the biggest firms usually have more resources to invest in innovation (Damanpour, 1992; Kimberly and Evanisko, 1981). In addition, size is commonly used as control variables in the studies of both innovation (Damanpour and Evan, 1984; Damanpour and Schneider, 2006; Kimberly and Evanisko, 1981; Laforet, 2008) and performance (Damanpour and Evan, 1984; Kimberly and Evanisko, 1981).

Firm age has an effect on organizational learning and performance (Aiken and Hage, 1971; Hitt et al., 1997; Pierce and Delbecq, 1977; Sørensen and Stuart, 2000). Sørensen and Stuart (2000) find that the experience and organizational competencies that age provides to firms help them to develop their operations more efficiently, including those related to innovation. The immature organizational routines of young companies may be an obstacle for innovation development. Therefore, size and age may improve the effect of innovation on performance and the effect of organizational learning on both innovation and performance.

Regarding industry, the effect of internal factors on innovation and performance varies across sectors (Damanpour, 1996; Vega-Jurado et al., 2008). Recently, some studies have included industry as a moderator of the relationship the present study proposes. In this line, the findings of Prajogo (2006) indicate a stronger correlation between innovation, mainly process innovation, and business performance for manufacturing firms than for service firms.

Finally, the perspective in the literature with regards to environmental turbulence is that turbulent environments put pressure on firms and make them bring new products to the market faster (Calantone et al., 2003; Olavarrieta and Friedmann, 2008). Therefore, in hostile environments, innovation is an obligation the environment imposes and that improves performance (Miller and Friesen, 1983). Li and Atuahene-Gima (2001) analyze the moderating effect of environmental turbulence in the relationships between innovation (product innovation) and performance of new technology ventures in China. They find that the innovation-performance link is contingent on environmental turbulence. Wright et al. (2005) also find that product innovation has a positive effect on performance in hostile environments. These studies show that environmental turbulence matters in the relationship between innovation and performance, although they only focus on product innovation.

However, high market turbulence may increase the uncertainty and the risk of innovation investment and, as a consequence, reduce the innovation activity of firms (March, 1991).The literature on organizational learning can shed light on this issue. Organizational learning allows firms to understand and interpret the environment, helping them to adapt to its changes better. Consequently, companies facing uncertainty and changing environments should promote organizational learning capacity in order to adapt to these changes (Lei et al., 1999; McGill and Slocum, 1993). Similarly, Wu and Shanley (2009) affirm that in dynamic environments, companies explore new ideas and develop new knowledge, especially in order to keep up with new technological developments. Thus, environmental turbulence may increase the effect of organizational learning on performance. In addition, in environments that are more turbulent innovation must rely on learning in order to be successful.

In summary, firm size and age, industry and environmental turbulence moderate the relationship between organizational learning and both innovation and performance, and the relationship between innovation and performance.

H4. Size, age, industry and environmental turbulence moderate the relationships between organizational learning, innovation and performance.

5. Method

5.1. Data collection and sample

Data for this study come from a more extensive research project supported by FEDER funds. The sample includes 1600 firms located in a southeast region of Spain that have more than 15 employees. 55% of

them belong to the manufacturing sector and 45% to the service sector.

The present study employs a personal interview, using a structured questionnaire, to collect data. The number of valid questionnaires the authors obtained was 451, yielding a response rate of 25.2%. This study compared respondent and non-respondent companies in terms of general characteristics and model variables. These comparisons did not reveal any significant differences, suggesting no response bias.

5.2. Measures

The three key constructs of this study are organizational learning, innovation and performance. Table 1 provides an overview of the means and standard deviations of the constructs, and the correlations between the variables.

5.2.1. Organizational learning

This study focuses on the Huber's model of organizational learning. After reviewing the theoretical literature (Lei et al., 1999; Slater and Narver, 1993) and empirical research (Baker and Sinkula, 1999; Hurley and Hult, 1998; Jerez-Gomez et al., 2005; Tippins and Sohi, 2003), the present study adopts the organizational learning scale of Perez Lopez et al. (2004). Table 2 shows the items of this scale, which cover the four subprocesses of the organizational learning model: knowledge acquisition (scale composite reliability $\rho_c^{SCR}=0.75$, average variance extracted $\rho_c^{AVE}=0.50$), information distribution ($\rho_c^{SCR}=0.78$, $\rho_c^{AVE}=0.54$), information interpretation ($\rho_c^{SCR}=0.77$, $\rho_c^{AVE}=0.54$) and organizational memory ($\rho_c^{SCR}=0.88$, $\rho_c^{AVE}=0.64$).

This study measures organizational learning as a single construct, made up of the four behavioral dimensions of this process. A second-order factor analysis demonstrates that the four dimensions reflect a higher-order construct (Table 3).

This study uses LISREL 8.50 to estimate the measurement model. The results suggest a good fit of the second-order specification for the measure of organizational learning ($\chi^2=117.19$, $df=61$; goodness-of-fit index [GFI]=0.96; root mean square error of approximation [RMSEA]=0.044; comparative fit index [CFI]=0.98; Tucker–Lewis index [TLI]=0.97; incremental fit index [IFI]=0.98). The GFI, CFI, TLI and IFI statistics exceed the recommended threshold level of 0.90 (Hoyle and Panter, 1995). The RMSEA is nearly 0.050 and the root mean square residual [RMR] and standardized RMR are 0.029 and 0.035, respectively, which indicates an acceptable fit.

5.2.2. Innovation

Previous research measures innovation in a variety of ways, as an output (e.g. new products or processes), inputs (e.g. R&D expenditure) or timing (e.g., pioneers, quick seconds, or late followers). In line with Manu (1992), this study uses six items for each type of innovation — product, process and administrative — covering the number of innovations, the proactive or reactive character of those innovations, and the resources the firm invests on innovation. The confirmatory factor analysis (Table 2) suggests the use of three items to measure product innovation ($\rho_c^{SCR}=0.81$, $\rho_c^{AVE}=0.59$), three to measure process innovation ($\rho_c^{SCR}=0.85$, $\rho_c^{AVE}=0.66$) and finally another three for administrative innovation ($\rho_c^{SCR}=0.92$, $\rho_c^{AVE}=0.79$). A second-order factor analysis demonstrates that a higher-order construct can model those three dimensions (Table 4). The results suggest a reasonable fit of second-order specification for this measure of innovation ($\chi^2=54.50$, $df=24$; GFI=0.98; RMSEA=0.051; CFI=0.99; TLI=0.98; IFI=0.99). GFI, CFI, TLI and IFI all exceed the recommended threshold level of 0.90 (Hoyle and Panter, 1995). The RMSEA is nearly 0.050 and the root mean square residual [RMR] and the standardized RMR are 0.029 and 0.035, respectively.

5.2.3. Performance

Previous literature defends the use of a range of performance measures, not just a single one, and not just financial indicators (Quinn and Rohrbaugh, 1983; Venkatraman and Ramanujam, 1986). In line with literature, the questionnaire used in this study asked the firms about the evolution of the their performance during the previous three years using items proposed by Quinn and Rohrbaugh (1983). They suggest that the concept of organizational performance includes different dimensions, which correspond to four basic models of organizational effectiveness: the human relations model, the internal process model, the open system model and the rational goal model. Exploratory analysis and confirmatory factor analysis (Table 2) identify only three models: the open/internal system ($\rho_c^{SCR}=0.76$, $\rho_c^{AVE}=0.52$), the rational goal model ($\rho_c^{SCR}=0.83$, $\rho_c^{AVE}=0.63$) and human relations model ($\rho_c^{SCR}=0.82$, $\rho_c^{AVE}=0.69$).

Additional analysis show that these three the second-order construct can model the three performance dimensions (see Table 5). The results suggest a good fit of the second-order specification ($\chi^2=28.83$, $df=17$; GFI=0.99; RMSEA=0.033; CFI=0.99; TLI=0.99; IFI=0.99). GFI, CFI, TLI and IFI all exceed the recommended threshold level of 0.90 (Hoyle and Panter, 1995). The RMSEA is below 0.050 and the root mean square residual [RMR] and the standardized RMR are 0.016 and 0.027 respectively, which are acceptable levels.

To assess the unidimensionality of each new construct, this study conducts a confirmatory factor analysis of the ten constructs, employing 30 items (Anderson and Gerbing, 1988). The measurement model provides a reasonable fit to the data ($\chi^2=659.05$, $df=360$; GFI=0.91; RMSEA=0.042; CFI=0.96; TLI=0.95; IFI=0.96). The traditionally reported fit indexes are within the acceptable range.

This study calculates reliability of the measures using Bagozzi and Yi's (1998) composite reliability index and Fornell and Larcker's (1981) average variance extracted index. For all the measures both indices are higher than the evaluation criteria, namely 0.6 for the composite reliability index and 0.5 for the average variance extracted index (Bagozzi and Yi, 1998). All items load on their hypothesized

Table 1
Construct correlation matrix.

Construct	Mean	Standard deviation	Correlation matrix									
			1	2	3	4	5	6	7	8	9	10
1. Knowledge acquisition	3.2	0.90	1									
2. Knowledge distribution	2.9	0.90	0.69	1								
3. Knowledge interpretation	3.4	0.78	0.57	0.78	1							
4. Organizational memory	3.8	0.95	0.40	0.42	0.41	1						
5. Product innovation	3.4	0.80	0.59	0.43	0.43	0.33	1					
6. Process innovation	3.5	0.71	0.46	0.32	0.32	0.25	0.65	1				
7. Administrative innovation	3.5	0.83	0.54	0.34	0.40	0.36	0.43	0.53	1			
8. Open/internal results	3.9	0.56	0.37	0.41	0.48	0.32	0.40	0.46	0.43	1		
9. Rational results	3.7	0.74	0.34	0.38	0.38	0.22	0.38	0.44	0.36	0.54	1	
10. Human results	3.5	0.88	0.31	0.26	0.24	0.13	0.29	0.33	0.21	0.34	0.46	1

Table 2
Construct measurement summary: confirmatory factor analysis and scale reliability.

Item description	Standardized loading	*T*-value	Reliability (SCR[a], AVE[b])
Knowledge acquisition			SCR = 0.75
1. The employees attend fairs and exhibitions regularly	0.69	12.69	AVE = 0.50 K
2. There is a consolidated and resourceful R&D policy	0.86	15.69	
3. New ideas and approaches on work performance are experimented continuously	0.82	18.73	
(Scale: 1 = totally disagree; 5 = totally agree)			
Knowledge distribution			SCR = 0.78
1. The company has formal mechanisms to guarantee the sharing of the best practices among the different fields of the activity	0.74	16.24	
2. There are individuals within the organization who take part in several teams or divisions and who also act as links between them	0.81	17.33	
3. There are individuals responsible for collecting, assembling and distributing internally employees' suggestions	0.83	16.58	AVE = 0.54
(Scale: 1 = totally disagree; 5 = totally agree)			
Knowledge interpretation			SCR = 0.77
1. All the members of the organization share the same aim to which they feel committed	0.74	19.20	AVE = 0.54
2. Employees share knowledge and experiences by talking to each other	0.68	17.17	
3. Teamwork is a very common practice in company	0.64	13.37	
(Scale: 1 = totally disagree; 5 = totally agree)			
Organizational memory			SCR = 0.88
1. The company has directories or e-mails filed according to the field they belong to, so as to find an expert on a concrete issue at any time	0.76	14.59	AVE = 0.64
2. The company has up-to-date databases of its clients	0.77	20.74	
3. There is access to organization's databases and documents through some kind of network (Lotus Notes, intranet, etc.)	0.95	19.61	
4. Databases are always kept up-to-date	0.95	24.43	
(Scale: 1 = totally disagree; 5 = totally agree)			
Product innovation			SCR = 0.81
1. Number of new products/services introduced	0.67	18.22	AVE = 0.60
2. Pioneer disposition to introduce new products/services	0.80	20.64	
3. Efforts to develop new products/services in terms of hours/person, teams and training involved	0.65	15.14	
(Scale: 1 = below competitors; 5 = above competitors; in past 3 years)			
Process innovation			SCR = 0.85
1. Number of changes in process introduced	0.65	19.74	AVE = 0.66
2. Pioneer disposition to introduce new process	0.73	22.98	
3. Clever response to new processes introduced by others companies in the same sector	0.57	16.72	
(Scale: 1 = below competitors; 5 = above competitors; in past 3 years)			
Administrative innovation			SCR = 0.91
1. Novelty of administrative systems	0.78	22.76	AVE = 0.76
2. Search for new administrative systems by managers	0.78	22.61	
3. Pioneer disposition to introduce new administrative systems	0.75	22.61	
(Scale: 1 = below competitors; 5 = above competitors; in past 3 years)			
Open-internal model results			SCR = 0.76
1. Quality product	0.37	11.85	AVE = 0.52
2. Internal process coordination	0.52	17.78	
3. Company and products' image	0.55	17.43	
(Scale: in past 3 years: 1 = decrease; 5 = increase)			
Rational model results			SCR = 0.83
1. Market share	0.57	16.08	AVE = 0.63
2. Profitability	0.72	19.65	
3. Productivity	0.71	20.56	
(Scale: in past 3 years: 1 = decrease; 5 = increase)			
Human relations model results			SCR = 0.82
1. Turnover	0.88	16.73	AVE = 0.69
2. Absenteeism	0.71	14.97	
(Scale: in past 3 years: 1 = decrease; 5 = increase)			

Fit statistics for measurement model of 30 indicators for ten constructs: $\chi^2_{(360)} = 659.05$; GFI = 0.91; RMSEA = 0.042; CFI = 0.96; TLI (NNFI) = 0.95.

[a] Scale composite reliability ($\rho_c = (\sum \lambda_i)^2 \mathrm{var}(\xi)/[(\sum \lambda_i)^2 \mathrm{var}(\xi) + \sum \theta_{ii}]$; (Bagozzi and Yi, 1998)).

[b] Average variance extracted ($\rho_c = (\sum \lambda_i^2 \mathrm{var}(\xi))/[\sum \lambda_i^2 \mathrm{var}(\xi) + \sum \theta_{ii}]$; (Fornell and Larcker, 1981)).

Table 3
Second-order confirmatory factor analysis of organizational knowledge.

First-order construct	First-order			Second-order	
	Indicator	Loading	*t*-value	Loading	*t*-value
Knowledge acquisition	KA1	0.58	–[a]	0.49	9.69
	KA2	0.70	10.56		
	KA3	0.83	11.12		
Knowledge distribution	ID1	0.72	–[a]	0.69	14.02
	ID2	0.76	13.92		
	ID3	0.73	13.53		
Knowledge interpretation	II1	0.81	–[a]	0.61	14.28
	II2	0.76	15.01		
	II3	0.62	12.47		
Organizational memory	OM1	0.64	–[a]	0.36	8.11
	OM2	0.83	14.49		
	OM3	0.80	14.08		
	OM4	0.92	15.33		

Fit statistics for measurement model of 13 indicators for four constructs: $\chi^2_{(61)} = 117.19$; GFI = 0.96; RMSEA = 0.044; CFI = 0.98; TLI (NNFI) = 0.97.
[a] Fixed parameter.

factors (see Table 2) and the estimates are positive and significant (the lowest t-value is 11.85), which provides evidence of convergent validity (Bagozzi and Yi, 1998). Finally, the confidence interval (±2 S.E.) around the estimated correlation between any two latent indicators never includes 1.0. These results support discriminant validity (Anderson and Gerbing, 1988).

5.2.4. Moderating variables

The present study measures firm *size* as the number of employees of the firm and calculates *age* as the number of years passed from the foundation of the firm. For measuring *industry*, the study uses a dummy variable (0 = service, 1 = manufacturing). Finally, *environmental uncertainty*'s measure includes three items regarding the unpredictability, complexity and hostility of changes in the environment (Mintzberg, 1979).

6. Analysis and results

The study uses structural equation modeling (SEM) to test the hypotheses. Figure 1 shows the proposed structural model. The analysis includes conventional maximum likelihood estimation techniques to test the model (Jöreskog and Sörbom, 1996). The fit of the model is satisfactory ($\chi^2 = 780.80$, $df = 392$; GFI = 0.90; RMSEA = 0.046; CFI = 0.94; TLI = 0.94; IFI = 0.94), suggesting that the nomological network of relationships fits the data — another indicator of support for the validity of the measurement scales (Churchill, 1979).

To provide greater confidence in the model configuration, Table 6 shows the findings of testing the theoretical model (M_T) against an alternative model (M_A) that treats innovation as an intermediate variable between organizational learning and performance, and omits the direct relationship between organizational learning and performance. Anderson and Gerbing (1988) recommend this procedure. They suggest the use of the chi-square difference test (CDT) to test the following null hypothesis,: $M_T - M_A = 0$. Compared with a less parsimonious M_A, a non-significant CDT would lead to acceptance of the more parsimonious M_T. Table 6 reports a significant change in chi-square between the proposed model and M_A. The CDT has a probability of $p < 0.01$, which allows us to conclude that the alternative model's fit is significantly worse.

Table 4
Second-order confirmatory factor analysis of innovation.

First-order construct	First-order			Second-order	
	Indicator	Loading	*t*-value	Loading	*t*-value
Product innovation	PI1	0.78	–[a]	0.49	11.23
	PI2	0.87	16.54		
	PI3	0.65	13.34		
Process innovation	CI1	0.81	–[a]	0.59	13.26
	CI2	0.90	19.67		
	CI3	0.71	15.86		
Administrative innovation	AI1	0.88	–[a]	0.46	10.51
	AI2	0.86	23.62		
	AI3	0.87	23.93		

Fit statistics for measurement model of 9 indicators for three constructs: $\chi^2_{(24)} = 54.50$; GFI = 0.98; RMSEA = 0.051; CFI = 0.99; TLI (NNFI) = 0.98.
[a] Fixed parameter.

Table 5
Second-order confirmatory factor analysis of performance.

First-order construct	First-order			Second-order	
	Indicator	Loading	*t*-value	Loading	*t*-value
Open/internal model	OR1	0.56	–[a]	0.23	7.62
	OR2	0.81	10.63		
	OR3	0.77	10.62		
Rational model	RR1	0.70	–[a]	0.49	9.80
	RR2	0.83	15.05		
	RR3	0.85	15.18		
Human relations model	HR1	0.84	–[a]	0.46	8.04
	HR2	0.82	10.05		

Fit statistics for measurement model of 8 indicators for three constructs: $\chi^2_{(17)} = 28.83$; GFI = 0.99; RMSEA = 0.033; CFI = 0.99; TLI (NNFI) = 0.99.
[a] Fixed parameter.

In terms of the hypotheses (Table 7), the findings for H_1 (Innovation → performance; $\beta_{95} = 0.57$, $p < 0.01$) suggest that innovation has a positive and significant effect on performance, supporting the widespread idea that innovation is a key driver of company success.

The findings also provide support for H_2 (Organizational learning → performance; $\gamma_{91} = 0.26$, $p < 0.01$) and H_3 (Organizational learning → innovation; $\gamma_{51} = 0.66$, $p < 0.01$), showing that the organizational learning has a positive effect on both performance and innovation. In addition, organizational learning effect on innovation is higher than its effect on performance. Taking into account the fact that innovation also improves performance, these results seem to reflect that innovation partially mediates the relationship between organizational learning and performance.

Finally, H_4 states that firm size, age, industry and environmental turbulence moderate the relationships between organizational learning, innovation and performance. To test these moderating effects this research uses the two-group comparison of structural equation modeling. This study splits the sample into two groups along the median of the levels of each variable (with the exception of industry, since this variable is dichotomous). One group contains firms with the higher levels of each moderator and the other group contains firms with lower levels. Then, the analysis includes a two-group comparison to examine the existence or not of differences in structural parameters between high and low values of these variables.

The first step constrains the parameter from hypothesized relationships (β_{95}, γ_{91} or γ_{51}) to be equal. In the second step, they do not constrain the parameter. If the difference between the two tests is significant (chi-square difference), that means that the variable used for splitting the sample moderates the relationship studied. The analysis repeats this method to study the possible moderating effect of the four variables in the three relationships included in this study model (see Table 8).

Table 8 shows that, although the relationships between organizational learning, innovation and performance are significant and positive for all the groups, the four variables studied influence how intense these relationships are. Thus, they moderate the relationships between the three main constructs of the model, confirming H_4.

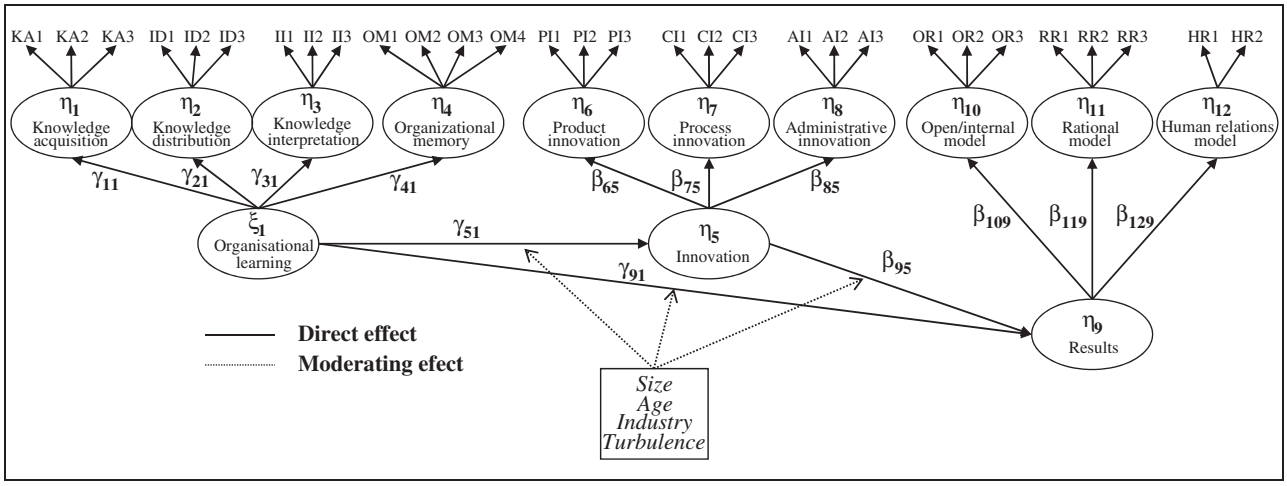

Fig. 1. A model of the relations between organizational learning, innovation and performance.

According to the findings, the relationship between innovation and performance is positive for all the groups but this relationship is stronger when firms are bigger, older and belong to manufacturing industry, which is consistent with previous research. However, the relationship is less strong when the firm operates in turbulent environments.

In contrast with this, the findings concerning the relationship between organizational learning and performance indicate that this relation is always positive but stronger for smaller and younger firms, services and in high turbulent environments. These results are only partially consistent with the previous literature.

Finally, the findings confirm that size, age, industry and environment moderate the relationship between organizational learning and innovation but their moderating effects are not always as expected. In particular, they show that the positive relationship between organizational learning and innovation is more intense in the group of firms that are smaller, older, operating in environments that are more turbulent and in the service sector.

7. Discussion

Despite the literature suggesting a positive relationship between organizational learning, innovation and performance, to date little research analyzes those relationships empirically, together in a single model. The first contribution of the present study to the literature is to examine such relationships

The findings of this study provide additional evidence to previous literature that innovation has a positive effect on performance (Bierly and Chakrabarti, 1996; Brown and Eisenhard, 1995; Caves and Ghemawat, 1992; Damanpour and Evan, 1984; Damanpour et al., 1989; Hansen et al., 1999; Roberts, 1999; Schulz and Jobe, 2001; Thornhill, 2006; Weerawardenaa et al., 2006; Wheelwright and Clark, 1992). Also, the findings show a positive relationship between organizational learning and performance (Baker and Sinkula, 1999; Bontis et al., 2002; Darroch and McNaughton, 2003; Keskin, 2006; Tippins and Sohi, 2003; Ussahawanitchakit, 2008), and between organizational learning and innovation (Forrester, 2000; Hult et al., 2004; Hurley and Hult, 1998; Keskin, 2006; Lee and Tsai, 2005; Mavondo et al., 2005; Salavou and Lioukas, 2003; Ussahawanitchakit, 2008).

The findings show that the effect of organizational learning on innovation is stronger than its effect on performance. This result may imply that organizational learning influences organizational performance mainly by facilitating innovation. These findings are consistent

Table 6
Sequential chi-square tests.

Model	Chi-square	Degrees of freedom	Chi-square difference	Degrees of freedom difference	Probability
Proposed model (M_T)	780.80	392	−7.37	1	0.0066[a]
Alternative model (M_A)	788.17	393			

[a] Compared to proposed model (M_T), alternative model (M_A) presents a significantly worse fit. So M_T is preferred as a better alternative.

Table 7
Construct structural model.

Linkages in model	Hypotheses		Standardized parameter estimates		
	Number	Sign	Parameter	Estimate	*t*-value
Hypothesis					
Innovation → performance	H_1	+	β_{95}	0.57	5.13***
Organizational learning → innovation	H_2	+	γ_{51}	0.66	8.78***
Organizational learning → performance	H_3	+	γ_{91}	0.26	2.94***
Second-order construct					
Organizational learning → acquisition			γ_{11}	0.78	10.27***
Organizational learning → distribution			γ_{21}	0.88	13.92***
Organizational learning → interpretation			γ_{31}	0.82	14.73***
Organizational learning → or. memory			γ_{41}	0.51	8.56***
Innovation → product innovation			β_{65}	0.77	11.46***
Innovation → process innovation			β_{75}	0.80	11.95***
Innovation → administrative innovation			β_{85}	0.65	10.94***
Performance → open/internal results			β_{109}	0.74	7.72***
Performance → rational results			β_{119}	0.74	8.52***
Performance → human relations results			β_{129}	0.53	7.62***

Fit statistics for the measurement model of 30 indicators for thirteen constructs: $\chi^2_{(392)} = 780.80$; GFI = 0.90; RMSEA = 0.046; CFI = 0.94; TLI (NNFI) = 0.94.
*** $P < 0.01$.

Table 8
Moderating effects of size, age, sector and environmental turbulence.

	Overall model	Size			Age			Sector			Environmental turbulence		
		Low	High	χ^2 difference	Low	High	χ^2 difference	Services	Industry	χ^2 difference	Low	High	χ^2 difference
Innovation → performance	0.57***	0.42***	0.70***	$\chi^2(1)=17.25$***	0.46***	0.75***	$\chi^2(1)=16.11$***	0.28**	0.63***	$\chi^2(1)=24.85$***	0.56***	0.43***	$\chi^2(1)=15.27$***
Organizational learning → performance	0.26***	0.39***	0.18	$\chi^2(1)=81.31$***	0.36***	0.07	$\chi^2(1)=122.73$***	0.48***	0.24**	$\chi^2(1)=189.39$***	0.28**	0.38***	$\chi^2(1)=139.41$***
Organizational learning → innovation	0.66***	0.69***	0.63***	$\chi^2(1)=179.06$***	0.65***	0.74***	$\chi^2(1)=227.57$***	0.69***	0.64***	$\chi^2(1)=351.18$***	0.73***	0.50***	$\chi^2(1)=182.85$***
R^2 (innovation)	0.44	0.47	0.39		0.42	0.54		0.47	0.41		0.54	0.25	
R^2 (performance)	0.59	0.55	0.68		0.56	0.65		0.51	0.42		0.62	0.49	

** $P<0.05$.
*** $P<0.01$.

with previous theoretical (Cohen and Levinthal, 1990; Hedlund, 1994; Kogut and Zander, 1992; Leonard-Barton and Sensiper, 1998; March, 1991; Nonaka and Takeuchi, 1995) and empirical (Baker and Sinkula, 1999; Hurley and Hult, 1998) studies.

Another contribution of this study relates to the measurement of innovation and organizational learning. Instead of adopting a cultural perspective, as previous literature, this article uses a broad measure of innovation, which covers the number of product, process and administrative innovations, the proactive or reactive character of those innovations and the resources the firm dedicates to innovation and measures the organizational learning process. Although innovation requires that cultural values foster learning (Cabello Medina et al., 2005; Lin and Chen, 2006; Mumford, 2000) firms should also develop an effective organizational learning process. Thus, its conclusions may be more helpful for those practitioners who want to enhance innovation, as changing actions is easier than changing values.

In addition, this study contributes to the literature by analyzing the likely moderating effect of firm size, age, industry and environmental turbulence on the relationships between organizational learning, innovation and performance. What this study finds is that these relationships remain significant and positive regardless of the level of the moderators but the intensity of these relationships changes. Organizational size increases the positive relationship between innovation and performance, as the literature suggests (Damanpour and Evan, 1984; Kimberly and Evanisko, 1981). However, the positive effect of organizational learning on both innovation and performance is greater for smaller firms. Bigger companies usually have more resources to invest in innovation. Therefore, they may depend on organizational learning processes less than smaller firms.

Regarding age, consistently to previous research, the findings of this study show that age makes the positive relationship between organizational learning and innovation more intense (Aiken and Hage, 1971; Hitt et al., 1997; Pierce and Delbecq, 1977; Sørensen and Stuart, 2000). These results seem to show that age allows the company to develop organizational routines that help them to conduct their activities more efficiently and, therefore, obtain better performance. However, in younger firms, the lack of consolidated routines means that innovation requires more effort from the organizational learning process.

Regarding industry, the positive impact of organizational learning and innovation on performance is higher for manufacturing firms than for services firms, but the relationship between organizational learning and innovation is stronger for services firms. Future research should analyze more in depth the effect of industry in the relations between organizational learning, innovation and performance.

Finally, this study analyzes the likely moderating effect of environmental turbulence. The findings show that the positive effect of innovation on performance is lower for the group of firms in highly turbulent environments, but that in this type of environment the positive effect of organizational learning on both innovation and performance is greater. These findings, on the one hand, seem to provide support for those who argue that market turbulence increases the risks of investment in innovations (March, 1991). On the other hand, these results are consistent with the idea of previous literature that firms facing uncertainty and changing environments should promote organizational learning in order to adapt to these changes (Lei et al., 1999; McGill and Slocum, 1993).

In summary, the present study contributes to the literature, first, by examining together, in a same model, the links between organizational learning, innovation and performance, and by using broad measures of all of them. Second, this study provides strong support for these links and show that they are significant and positive regardless of firm size, age, industry or environmental turbulence, although these variables influence how intense the relationships between them are. Third, the present study uses a sample of Spanish companies, a context in which the empirical literature is especially scant.

The findings of this study have implications for practitioners. Although the idea that innovation influences performance has gained recognition among practitioners, how to go about this process remained unclear (Han et al., 1998). The present study suggests that organizational learning facilitates innovation. Therefore, an organization hoping to enhance corporate performance through innovation should improve its organizational learning processes. This conclusion seems to be especially important for smaller and younger firms and for those firms operating in highly turbulent environments. Some recommendations in this line are the following.

First, firms should promote the acquisition of new knowledge, for example by making employees attend fairs and exhibitions regularly, consolidating their R&D policy and fostering the development of new ideas and experimentation within the firm. Second, they should enhance the knowledge distribution and interpretation within the firm, for example by using formal mechanisms to guarantee the sharing of best practice among different employees and departments, making employees talk to each other, using teamwork, making individuals responsible for collecting, assembling and distributing employee's suggestions internally. Thirdly, firms should try to keep inside the firm for future use the knowledge they create by updating databases and facilitating access to these databases through different networks.

This study has some limitations that should be taking into account when interpreting its results. First, the survey uses single informants as the source of information. Although the use of single informants remains the primary research design in most studies, multiple informants would enhance the validity of the research findings. In order to get round this limitation, the authors tested the absence of common method variance that the use of a single informant can cause. The results confirm the lack of a unique factor with eigenvalue greater than one (Podsakoff et al., 2003). A second limitation is the cross-sectional design of this research. Thus, researchers should interpret with caution the causality between the constructs (Tippins and Sohi, 2003). Third, although this study uses a broad measure for organizational performance, this measure is subjective.

Future research should attempt to overcome the limitations of this research. One key point is to use an objective measure of performance. This action could also help to overcome the limitation of using a single informant. On the other hand, in order to examine the effect of innovation and organizational learning on company performance, future research should also use longitudinal studies. As organizational learning and innovation processes require some time to affect performance, this type of method could help to study the causality of these relationships. In addition, a longitudinal study would allow to analyze not only the positive outcomes related to innovation, but also the negative outcomes, as recent studies suggest (Simpson et al., 2006).

Some additional recommendations for future research are the following. One is to compare the effects between each phase of the organizational learning process and different types of innovation (Terziowski, 2002). Another suggestion is to examine whether the quality of the innovation (incremental or radical) has any influence on the results. According to the literature, incremental and radical innovations could require different resources, core competencies and organizational learning activities (Darroch and McNaugton, 2002). Finally, more research should examine more in depth the effects of firm size, age, industry and environmental turbulence on the relationships between organizational learning, innovation and performance.

Acknowledgements

The authors express their gratitude for financial support received from CajaMurcia Foundation, the Spanish Ministry of Education and Science (SEJ2006-08854/ECON), and the Regional Agency of Science and Technology of the Murcia Region-Seneca (08663/PHCS/08).

References

Aiken M, Hage J. The organic organization and innovation. Sociology 1971;5:63–82.
Anderson JC, Gerbing DW. Structural equation modelling in practice: a review and recommended two-step approach. Psychol Bull 1988;103(3):411–23.
Bagozzi RP, Yi Y. On the evaluation of structural equation model. J Acad Mark Sci 1998;16(1):74–94.
Baker WE, Sinkula JM. The synergistic effect of market orientation and learning orientation on organizational performance. J Acad Mark Sci 1999;27(4):411–27.
Baker WE, Sinkula JM. Market orientation, learning orientation and product innovation: delving into the organization's black box. J Market Focus Manage 2002;5(1):5-23.
Balkin DB, Markaman GD, Gómez-Mejía LR. Is CEO pay in high-technology firms related to innovation? Acad Manage J 2000;43(6):1118–29.
Bierly P, Chakrabarti AK. Generic knowledge strategies in the US pharmaceutical industry. Strateg Manage J 1996;17:123–35 [Winter special issue].
Bontis N, Crossan MM, Hulland J. Managing an organizational learning system by aligning stocks and flows. J Manage Stud 2002;39(4):437–69.
Brockmand B, Morgan F. The role of existing knowledge in new product innovativeness and performance. Decis Sci 2003;32(2):385–419.
Brown SL, Eisenhard KM. Product development: past research, present findings, and future directions. Acad Manage Rev 1995;20(2):343–78.
Cabello Medina Carmen, Carmona Lavado A, Valle Cabrera R. Characteristics of innovative companies: a case study of companies in different sectors. Creat Innov Manage 2005;14(3):272–87.
Calantone R, Garcia R, Dröge C. The effects of environmental turbulence on new product development strategy planning. J Prod Innov Manage 2003;20(2):90-103.
Caves RE, Ghemawat P. Identifying mobility barriers. Strateg Manage J 1992;13(1): 1-12.
Chang Dae Ryun, Cho Hang. Organizational memory influences new product success. J Bus Res 2008;61:13–23.
Churchill JLC. A paradigm for developing better measures of marketing construct. J Mark Res 1979;XVI:64–73 [February].
Cohen WM, Levinthal DA. Absorptive capacity: a new perspective on learning and innovation. Adm Sci Q 1990;35(1):128–54.
Coombs Rod, Hull Richard. Knowledge management practices and path-dependency in innovation. Res Policy 1998;27(3):237–53.
Damanpour F. Organizational innovation: a meta-analysis of effects of determinants and moderators. Acad Manage J 1991;34(3):550–90.
Damanpour F. Organizational size and innovation. Organ Stud 1992;13(3):375–402.
Damanpour F. Bureaucracy and innovation revisited: effects of contingency factors, industrial sectors, and innovation characteristics. J High Technol Manage Res 1996;7:150–75.
Damanpour F, Evan W. Organizational innovation and performance: the problem of organizational lag. Adm Sci Q 1984;29(3):392–409.
Damanpour F, Gopalakrishnan S. Theories of organizational structure and innovation adoption: the role of environmental change. J Eng Tech Manage 1998;15(1):1-24.
Damanpour Fariborz, Schneider Marguerite. Phases of the adoption of innovation in organizations: effects of environment, organization and top managers. Br J Manage 2006;17(3):215–36.
Damanpour F, Szabat KA, Evan WM. The relationship between types of innovation and organizational performance. J Manage Stud 1989;26(6):587–601.
Damanpour F, Walter RM, Avellaneda CN. Combinative effects of innovation types and organizational performance: a longitudinal study of service organizations. J Manage Stud 2009;46(4):650–75.
Darroch J, McNaugton R. Examining the link between knowledge management practices and types of innovation. J Intellect Cap 2002;3(3):210–22.
Darroch J, McNaugton R. Beyond market orientation: knowledge management and the innovativeness of New Zealand firms. Eur J Mark 2003;37(3/4):572–93.
Day GS. The capabilities of the market-driven organizations. J Mark 1994;58(4):37–52.
Dewar Robert D, Dutton Jane E. The adoption of radical and incremental innovations: an empirical analysis. Manage Sci 1986;32(11):1422–33.
Dickson Peter R. The static and dynamic mechanics of competition: a comment on Hunt and Morgan's comparative advantage theory. J Mark 1996;60(4):102–6.
Dodgson M. Organizational learning: a review of some literatures. Organ Stud 1993;14 (3):375–94.
Evan W. The organization set: towards a theory of interorganizational relations. In: Thompson J, editor. Approaches in organization design. Pittsburg, PA: Pittsburg University Press; 1966, pp. 173–91.
Fiol CM, Lyles MA. Organizational learning. Acad Manage Rev 1985;10(4):803–13.
Fornell C, Larcker DF. Evaluating structural equation models with unobservable variables and measurement error. J Mark Res 1981;XXVII:39–50 [February].
Forrester Rosalind H. Capturing learning and applying knowledge: an investigation of the use of innovation teams in Japanese and American automotive firms. J Bus Res 2000;47(1):35–45.
Garvin David A. Building a learning organization. Harv. Bus. Rev. 1993;71(4):78–91.
Gnyawali DR, Steward AC, Grant JH. Creation and utilization of organizational knowledge: an empirical study of the roles of organizational learning on strategic decision making. Acad Manag Proc 1997:16–20.
Hage J. Theories of organizations. New York: Wiley; 1980.
Hage J. Organizational innovation and organizational change. Annu Rev Sociol 1999;25: 597–622.
Hall Richard, Andriani Pierpaolo. Managing knowledge associated with innovation. J Bus Res 2003;56:145–52.
Han JK, Kim N, Shrivastava R. Market orientation and organizational performance: is innovation a missing link? J Mark 1998;62(4):30–45.

Hansen M, Nohria T, Tierney T. What's your strategy for managing knowledge? Harv Bus Rev 1999;77(2):106–16.
Hedlund G. A model of knowledge management and the N-form corporation. Strateg Manage J 1994;15:73–90 [Summer Special Issue].
Hitt MA, Hoskisson RE, Kim H. International diversification: effects on innovation and firm performance in product-diversified firms. Acad Manage J 1997;40(4):767–98.
Hoyle RH, Panter AT. Writing about structural equation modeling. In: Hoyle RH, editor. Structural equation modelling. Thousand Oaks: Sage; 1995, pp. 158–76.
Huber George P. Organizational learning the contributing processes and the literatures. Organ Sci 1991;2(1):88-115.
Hult G, Tomas M, Hurley RF, Knight GA. Innovativeness: its antecedents and impact on business performance. Ind Mark Manage 2004;33:429–38.
Hurley RE, Hult GTM. Innovation, market orientation and organizational learning: an integration and empirical examination. J Mark 1998;62:42–54 [July].
Jerez-Gomez Pilar, Cespedes-Lorente José, Valle-Cabrera Ramón. Organizational learning capability: a proposal of measurement. J Bus Res 2005;58:715–25.
Jöreskog Karl G, Sörbom Dag. LISREL 8 user's reference guide. Chicago: Scientific Software International; 1996.
Keskin H. Market orientation, learning orientation, and innovation capabilities in SMEs. Eur J Innov Manage 2006;9(4):396–417.
Kimberly JR, Evanisko MJ. Organizational innovation: the influence of individual, organizational, and contextual factors on hospital adoption of technological and administrative innovations. Acad Manage J 1981;24:689–713.
Knight K. A descriptive model of the intra-firm innovation process. J Bus 1967;40(4): 478–96.
Kogut B, Zander U. Knowledge of the firm, combinative capabilities and the replication of technology. Organ Sci 1992;3(3):383–97.
Laforet Sylvie. Size, strategic, and market orientation affects on innovation. J Bus Res 2008;61(7):753–64.
Lee TS, Tsai HJ. The effects of business operation mode on market orientation, learning orientation and innovativeness. Ind Manage Data Syst 2005;105(3):325–48.
Lei D, Slocum JW, Pitts RA. Designing organizations for competitive advantage: the power of unlearning and learning. Organ Dyn 1999;27(3):24–38.
Leonard-Barton D. Wellsprings of knowledge: building and sustaining the sources of innovation. Boston, Massachusetts: Harvard Business School Press; 1999.
Leonard-Barton D, Sensiper S. The role of tacit knowledge in group innovation. Calif Manage Rev 1998;40(3):112–32.
Li Haiyang, Atuahene-Gima Kwaku. Product innovation strategy and the performance of new technology ventures in china. Acad Manage J 2001;14(6):1123–34.
Lin Bou-Wen, Chen Chung-Jen. Fostering product innovation in industry networks: the mediating role of knowledge integration. Int J Hum Resour Manage 2006;17(1): 155–73.
Lyon D, Ferrier W. Enhancing performance with product–market innovation: the influence of the Top Management Team. J Manage Issues 2002;14(14):452–69.
Mansury Mica Ariana, Love James H. Innovation, productivity and growth in US business services: a firm-level analysis. Technovation 2008;28(1–2):52–62.
Manu Franklyn A. Innovation orientation, environment and performance: a comparison of U.S. and European markets. J Int Bus Stud 1992;23(2):333–59.
March James G. Exploration and exploitation in organizational learning. Organ Sci 1991;2(1):71–87.
Mavondo Felix T, Chimhanzi Jacqueline, Stewart Jillian. Learning orientation and market orientation: relationship with innovation, human resource practices and performance. Eur J Mark 2005;39(11/12):1235–63.
McGill ME, Slocum JW. Unlearning the organization. Organ Dyn 1993;22(2):67–79.
Miles RE, Snow CHC. Organizational strategy, structure and process. New York: McGraw Hill; 1978.
Miller D, Friesen PH. Strategy-making and environment. Strateg Manage J 1983;4: 221–35.
Mintzberg H. The structuring of organizations. Englewood Cliffs: Prentice-Hall, Inc.; 1979.
Mumford Michael D. Managing creative people: strategies and tactics for innovation. Hum Resour Manage Rev 2000;10(3):313–51.
Nevis E, Dibella A, Gould J. Understanding organizations as learning systems. Sloan Manage Rev 1995;36(2):73–85.
Nonaka I. The knowledge-creating company. Harv Bus Rev 1991;69(6):96-104.
Nonaka I. A dynamic theory of organizational knowledge creation. Organ Sci 1994;5(1): 14–37.
Nonaka I, Takeuchi H. The knowledge-creating company. New York. USA: Oxford University Press; 1995.
Nooteboom Bart. Innovation, learning and industrial organizations. Camb J Econ 1999;23(2):127–50.
Normann R. Organizational innovativeness: product variation and reorientation. Adm Sci Q 1971;16(2):203–15.
North D, Smallbone D, Vickers I. Public sector support for innovating SMEs. Small Bus Econ 2001;16:303–17.
Olavarrieta Sergio, Friedmann Roberto. Market orientation, knowledge-related resources and firm performance. J Bus Res 2008;61(6):623–30.
Perez Lopez S, Montes Peon JM, Vazquez Ordas CJ. Managing knowledge: the link between culture and organizational learning. J Knowl Manage 2004;8(6):93-104.
Pierce JL, Delbecq AL. Organization structure, individual attitudes and innovation. Acad Manage Rev 1977;2:27–37 [January].
Podsakoff Philip M, MacKenzie Scott B, Lee Jeong-Yeon, Podsakoff Nathan P. Common method biases in behavioral research: a critical review of the literature and recommended remedies. J Appl Psychol 2003;88(5):879–903.
Prajogo DI. The relationship between innovation and business performance — a comparative study between manufacturing and service firms. Knowl Process Manage 2006;13(3):218–25.
Quinn RE, Rohrbaugh J. A spatial model of effectiveness criteria: towards a competing values approach to organizational analysis. Manage Sci 1983;29(3):363–77.
Roberts Peter W. Product innovation, product–market competition and persistent profitability in the U.S. pharmaceutical industry. Strateg Manage J 1999;20(7):655–70.
Rogers EM. Diffusion of innovations. New York: The Free Press; 1995.
Salavou H, Lioukas S. Radical product innovations in SMEs: the dominance of entrepreneurial orientation. Creat Innov Manage 2003;12(2):94-108.
Scherer EM. Schumpeter and plausible capitalism. J Econ Lit 1992;30:1416–33.
Schulz M, Jobe LA. Codification and tacitness as knowledge management strategies: an empirical exploration. J High Technol Manage Res 2001;12(1):139–65.
Senge PM. The fifth discipline: the art & practice of the learning organization. London: Ramdom House; 1990.
Simpson Penny M, Siguaw Judy A, Enz Cathy A. Innovation orientation outcomes: the good and the bad. J Bus Res 2006;59:1133–41.
Sinkula JM. Market information processing and organizational learning. J Mark 1994;58 (1):35–45.
Slater SF, Narver JC. Product–market strategy and performance: an analysis of the Miles y Snow strategy types. Eur J Mark 1993;27(10):33–51.
Slater SF, Narver JC. Market orientation and the learning organization. J Mark 1995;59 (3):63–74.
Sørensen Jesper B, Stuart Toby E. Aging, obsolescence, and organizational innovation. Adm Sci Q 2000;45(1):81-112.
Stata R. Organizational learning — the key to management innovation. Sloan Manage Rev 1989;30(3):63–74.
Terziowski M. Achieving performance excellence through and integrated strategy of radical innovation and continuous improvement. Meas Bus Excell 2002;6(2):5-14.
Thompson VA. Bureaucracy and innovation. Adm Sci Q 1965;10(1):1-20.
Thornhill Stewart. Knowledge, innovation and firm performance in high- and low-technology regimes. J Bus Venturing 2006;21(5):687–703.
Tippins MJ, Sohi RS. IT competency and firm performance: is organizational learning a missing link. Strateg Manage J 2003;24(8):745–61.
Tushman ML, Nadler DA. Organizing for innovation. Calif Manage Rev 1986;28(3): 74–92.
Ussahawanitchakit Phapruke. Impacts of organizational learning on innovation orientation and firm efficiency: an empirical assessment of accounting firms in Thailand. Int J Bus Res 2008;8(4):1-12.
Utterback JM. Mastering the dynamics of innovation: how companies can seize opportunities in the face of technological change. Boston: Harvard Business School Press; 1994.
Utterback JM, Abernathy W. A dynamic model of product and process innovation. Omega 1975;3(3):639–56.
Vega-Jurado Jaider, Gutierrez-Gracia Antonio, Fernandez-de-Lucio Ignacio, Manjarres-Henriquez Liney. The effect of external and internal factors on firms' product innovation. Res Policy 2008;37(4):616–32.
Venkatraman N, Ramanujam V. Measurement of business performance in strategy research: a comparison of approaches. Acad Manage Rev 1986;11(4):801–14.
Vrakking WJ. The innovative organization. Long Range Plann 1990;23(2):94-102.
Weerawardena Jay, O'Cass Aron, Julian Craig. Does industry matter? Examining the role of industry structure and organizational learning in innovation and brand performance. J Bus Res 2006;59:37–45.
Weerawardenaa Jay, O'Cass Aron, Julian Craig. Does industry matter? Examining the role of industry structure and organizational learning in innovation and brand performance. J Bus Res 2006;59:37–45.
Weerd-Nederhof P, Pacitti B, Da Silva Gomes J, Pearson A. Tools for the improvement of organization learning processes in innovation. J Workplace Learn 2002;14(8): 320–31.
Wheelwright SC, Clark KB. Revolutionizing product development: quantum leaps in speed, efficiency and quality. New York: The Free Press; 1992.
Wolfe RA. Organizational innovation: review, critique and suggested research directions. J Manage Stud 1994;31(3):405–31.
Wright RE, Palmer JC, Perkings D. Types of product innovations an small business performance in hostile and benign environments. J Small Bus Strat 2005;15(2): 33–44.
Wu Jianfeng, Shanley Mark T. Knowledge stock, exploration, and innovation: research on the United States electromedical device industry. J Bus Res 2009;62(4):474–83.
Yeung ACL, Lai K, Yee RWY. Organizational learning, innovativeness and organizational performance: a qualitative investigation. Int J Prod Res 2007;45(11):2459–77.
Yli-Renko H, Autio E, Sapienza HJ. Social capital, knowledge acquisition, and knowledge exploitation in young technology-based firms. Strateg Manage J 2001;22(6–7): 587–613.
Zheng Wei, Yang Baiyin, McLean Gary N. Linking organizational culture, structure, strategy, and organizational effectiveness: mediating role of knowledge management. J Bus Res 2010;63(7):763–71.