



# Organizational learning measurement and the effect on firm innovation

Organizational  
learning  
measurement

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## Abstract

**Purpose** – The purpose of this paper is to propose and validate a measurement scale to capture organizational learning capabilities (OLC) and examine how OLC affects innovation. There are several models in the literature that have been generated by statistical data from manufacturing firms. This paper presents a structural equation model in order to measure OLC in Iranian ceramic tile manufacturers. The proposed model has five dimensions – i.e. managerial commitment and empowerment, experimentation, risk taking, interaction with the external environment and openness and knowledge transfer and integration – and is evaluated by 23 items.

**Design/methodology/approach** – Data were collected from 18 Iranian ceramic tile manufacturers. The survey was sent to employees of the business section of each factory and a total of 173 valid questionnaires were obtained and used to test the research model, employing confirmatory factor analysis (CFA), a particular analysis of structural equation modeling methods.

**Findings** – In the validation process, both the principal components and the confirmatory factor analyses clearly corroborate the existence of the five dimensions mentioned in the theoretical work. Likewise, the scale provides information that could be used by those managers wishing to improve learning capability in their firms. In addition, the results show that the OLC has a positive impact on innovation.

**Originality/value** – This research suggests that that organizational environments that facilitate learning are more innovative. In addition, the OLC literature shows that OLC has a significant impact on the effectiveness and performance of the organization. Therefore, it is essential to find a valid measurement that can evaluate OLC in an organization. The five-factor model introduced in this paper is a practical way to measure OLC. As a result, managers can determine which organizational learning issues are strong and which are weak; this is a hint for improvement.

**Keywords** Organizational learning capability measurement, Innovation, Structural equation modeling, Learning organizations

**Paper type** Research paper

## 1. Introduction

It is universally accepted that innovation is the key for the future growth insurance and survival of any firm (Tran, 2008). Innovation allows organizations to coordinate themselves with the changes of the environment, market and customer demand. Twati found that there is a relationship between organizational culture innovations and the adoption of information system (Twati and Gammack, 2006). Bueno described the innovation as a critical factor in organization performance and survival of the firms in a competitive environment (Bueno and Ordonez, 2004). The importance of product innovation for good long-term company results is now widely recognized and has been extensively reported in the literature. In result, because of the importance of



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innovation, many researchers have analyzed its antecedents, hoping to determine what a firm must do if it hopes to become more innovative (Gordon and Tarafdar, 2007).

The close context of innovation and organizational learning capabilities (OLC) cause scholars to consider the possibility of the significant impact of OLC on innovation (Senge, 1990; Alegre and Chiva, 2008). Banutu-Gomez (2004) expressed that OLC plays a critical role on the effectiveness of organizations and enhances their potential to innovate and grow. Chiva goes as far as to state that one of the main reasons for the growing importance of the OLC during the past years is the need for innovation in the fast changing environment (Chiva and Alegre, 2009). Although most scholars agree on the positive effect of the OLC on innovation, there are a few empirical researches that investigate it.

Our aim in this paper is to practically evaluate the relationship between OLC and innovation. Thus it is important to find an appropriate OLC measurement scale regarding the organizational learning (OL) literature. Reviewing OL literature shows that OLC does not only affect on innovation but also influences on a lot of organizational concepts like job satisfaction, quality of products, performance, TQM, knowledge management, adoption of information system and etc. Furthermore, the OLC measurement scale helps the managers to recognize the facilitative factors of learning and evaluate the OLC in their firms; then they can develop the organizational learning in their companies.

Since the time that the organizational learning is known as an essential element to survive firms, different scholars consider this concept from different viewpoints such as psychological, sociological, organizational theory and industrial economy (Banutu-Gomez, 2004). This fact and the complex nature of OLC, lead to the lack of consensus on this concept. Studying the OL reveals that many researchers work towards OLC measuring and develop various normative models. These models are similar in some aspects and are different in others, i.e. there is no model that is accepted by all. In this paper, a lot of various models were considered to develop a structural equation model for measuring OLC that is compatible with its multidimensional nature, then because of the importance of the innovation was examined whether OLC could improve innovation in the firms. Data were obtained from a survey carried out in the 18 Industrial Ceramic tile manufactures.

The remaining of the paper is organized as follows. This introduction is followed by a brief review of the concept of OLC in Section 2. In section 3 the dimensions of other exiting OLC measurements was considered to develop a measurement scale according to its complex nature. Section 4 sets out a theoretical review of innovation supporting the development of a measurement scale. The three existing models i.e. Goh, Chiva and Gomez are used to obtain a new model in section 5. Paying particular attention to checking the validity of our proposed model, in section 6, the relationship between OLC and innovation was tested and the methodology of this research was explained. Finally, section 7 concludes the paper.

## **2. Literature review and hypotheses**

### *2.1 The organizational learning literature*

The importance of the factors that facilitate organizational learning (OL) has traditionally related to the learning organization (LO) literature, which mainly focuses on the development of normative models for the creation of a learning organization (Rebelo and Gomes, 2011). So in this session OL/LO literature is reviewed.

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The concept of learning organization was initiated in 1900, when Teylor discovered the positive effect of the knowledge transfer on the performance and productivity improvement in the factory. Nonetheless, Cyert and March were the first scholars who put learning and organization together and created organizational learning phrase in the organization literature. The growing body of organizational learning research introduces a perspective that learning is not only the capability of individuals; learning can also happen on a group level and is facilitated by an organizational climate that provides the conditions and motivations for learning (Nemeth, 1997). Since 1990, learning has made a critical distinction between organizations, and then it became an essential subject and soon the phenomenon of the organizational learning was increasingly becoming a source of interest among researchers and practitioners (Jyothibabu and Farooq, 2010).

Organizational learning is widely discussed in the literature across a myriad of fields, ranging from patient safety in health care and military readiness to library effectiveness, from information systems to student learning in school systems (Atwood and Mora, 2010). Through learning, organizations can adapt to the environmental constraints, avoid the repetition of past mistakes and preserve crucial knowledge that might otherwise be lost (Dixon, 1993). OLC is multi disciplinary, so researchers look at it from different viewpoints, from psychological view (like Cyert and March, Daft and Weick), form sociological insight (such as Nelson and Winter, Levitt and March) or from the point of view of organizational theory (like Cangelosi and Dill, Senge, Huber). More recently, some authors (Grant, Lei *et al.*) have considered learning, from a strategic perspective (Jerez-Gomez *et al.*, 2005). OLC is not only multi disciplinary, but is also multi level beginning from individual level to the organizational level.

In despite of much research on the concept and application of OLC, it is still ambiguous and through the years many authors find this concept difficult to understand and have asked for clarity (Burgoyne, 1997; Garvin, 1993; Jacobs, 1995; Jones and Hendry, 1994; Leitch *et al.*, 1996; Ulrich *et al.*, 1993). However there does not exit a unique definition of OLC. Table I shows some important definitions of OL/LO.

Regarding these definitions, in this paper OL is considered to help organizations to create, transfer and integrate knowledge and expertise and learn from these how to improve themselves continuously. Organizational learning capability is the organizational and managerial characteristics that facilitate the organizational learning process.

### 3. Organizational learning capability measurement

The learning organization appears to be an important competence for all organizations to develop in order to succeed. In fact, some researchers cite the learning organization as the only sustainable competitive advantage in response to an increasingly unpredictable and turbulent business environment (Weldy and William, 2010). Due to the crucial importance of OLC in the current dynamic and competitive environment, it is critical to find a valid measure to assess OLC in firms. This measurement not only assists managers to understand which factors affect OLC but also help them to evaluate the value of their firms. Therefore, detection of weaknesses and opportunities, the factories could improve their position in the current fast changing environment.

Since 1990, scholars depicted organizational learning as a complex and multidimensional construct. Slater and Narver asserted that “organizational learning is a complex, multidimensional construct occurring at different cognitive levels . . . ,

Definition	Reference
Organizational learning is the process which recognize and modify faults	Argyris and Schon (1996)
Organizational learning is a process by which knowledge about action outcome relationships between the organization and the environment is developed	Daft and Weick (1984)
Organizational learning means the process of improving actions through better knowledge and understanding	Fiol and Lyles (1985)
Learning organizations are organizations where people continually expand their capacity to create the results they truly desire, where new and expansive patterns of thinking are nurtured, where collective aspirations are set free and where people are continually learning how to learn together	Senge (1990)
Organizational learning is a dynamic process that involves moving between different levels of action, going from the individual to the group level, from there to the organizational level, and vice versa	Huber (1991)
Organizational learning develop organizational capabilities to do effective actions	Kim (1993)
OL is the capacity (or processes) within an organization to maintain or improve performance based on experience	DiBella <i>et al.</i> (1996)
The process of global organizational learning in purchasing refers to the ability of an organization to transfer and integrate the information and expertise developed in various parts of the purchasing network to all other parts worldwide	Tomas <i>et al.</i> (1997)
Organizational learning as the capability of an organization to process knowledge, in other words, to create, acquire, transfer, and integrate knowledge, and to modify its behavior to reflect the new cognitive situation, with a view to improving its performance	Jerez-Gomez <i>et al.</i> (2005)
Organizational learning, generally defined as the process by which organizations learn and organizational learning capability, considered as the organizational and managerial characteristics that facilitate the organizational learning process or allow an organization to learn	Chiva and Alegre (2007)
Organizational learning refers to the capacity or processes within a firm enabling the acquisition of, access to and revision of organizational memory, thereby providing directions for organizational action	Lin (2008)

**Table I.**  
Definition of LO and OL

and encompassing multiple sub processes” (Tomas *et al.*, 1997), thus various aspects must be present in order to develop an effective learning capability.

Through the years, authors proposed number of measurement scales for assessing an organization’s current status in relation to the learning organization concept. Senge discussed that organizational learning incorporates the five “disciplines”: systems thinking, personal mastery, mental models, shared vision, and team learning. Within the marketing literature, Day introduced four learning capabilities (i.e. open-minded inquiry, synergistic information distribution, mutually informed interpretations, and accessible memory) as the basis for organizational learning (Tomas *et al.*, 1997). Indeed it can be said that OL literature proposes a variety of facilitating factors of organizational learning (Chiva and Alegre, 2007).

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Table II reveals the separate sets of learning foundations proposed.

In this paper, three existing models, Goh, Chiva and Gomez were considered to develop an appropriate measurement scale to measure OLC in the Iranian Ceramic Tile Industry. This measurement contains five dimensions that are explained completely in section 5.1.

#### 4. The organizational innovation literature

Scholars have provided various definitions of innovations in an attempt to explain what they understand by innovativeness. Some important definitions of this concept are listed in Table III.

Joseph Schumpeter was the first who discovered the critical role of innovation in economic growth of countries. He discussed that innovation appears like one of these patterns, the introduction of a new goods and the introduction of a new method of production, the opening of a new market, the conquest of a new supply source of raw materials or half-manufactured goods or carrying out of the new organization of any industry (Schumpeter, 1934, p. 66).

Organizational innovation is fast becoming a crucial factor in company survival as a result of the evolution of the competitive environment. In this vein, Bachalandra and Friar considered that the successful introduction of new products is the lifeblood of most organizations (Alegre and Chiva, 2008).

##### 4.1 *Measuring innovation in organization*

The measurement of innovation is likely to be difficult due the broad nature of the scope of innovative activities (Rogers, 1998). In the innovation literature, various approaches are discussed and evaluated to measure innovative activity. Some researchers consider organizational innovativeness as a uni-dimensional subject (Wilson *et al.*, 1966). Some of these dimensions have been highlighted for example; product or market focus, process related, technology/research and development-based or behavioral-based, while some others considered the innovation as a multi-dimensional subject. Salavou (2004) proposed an approach that includes the elapsed time of adoption, level of research and development expenditure, the economic value of innovations, the number of innovations adopted by a firm out of innovations and subjective measure. While the measurement approach of Knowles (2007) includes current technology, self-evaluation, research and development funding, Number of the new product introduces by firm and Intellectual property.

The more agile companies are also found to be using technology to promote productivity, new product development and customer satisfaction (Wu, 2006), so current technology is critical for innovation. Filippetti (2011) considered design and R&D as complementary sources of innovation.

According to Freeman (1982), product innovation is a process that includes the technical design, R&D (Research and Development), manufacturing, management and commercial activities involved in the marketing of a new (or improved) product.

In order to be able to examine the effect of OLC on innovation, one should find a measurement tool to measure innovation. In this paper, regarding innovation literature a valid measurement tool was proposed to measure organizational innovation, which was explained completely in section 5.2.

Author	Foundation
Galer and Van der Heijden (1992)	<ol style="list-style-type: none"> <li>1. Learning culture</li> <li>2. Openness</li> <li>3. Freedom to experience</li> <li>4. Commitment to learning</li> <li>5. Closeness in planning and action</li> <li>6. Capture of lessons learned</li> <li>7. Mutual trust</li> <li>8. Coordination of activities</li> </ol>
Garvin (1993)	<ol style="list-style-type: none"> <li>1. Problem-solving</li> <li>2. Experimentation</li> <li>3. Learning from experiences and history</li> <li>4. Learning from best practices of others</li> <li>5. Efficient transferring of knowledge and skills within the organization</li> </ol>
Nevis <i>et al.</i> (1995)	<ol style="list-style-type: none"> <li>1. Information gathering practices in the internal and external environment</li> <li>2. Awareness of performance gaps to motivate learning</li> <li>3. Effort spent on measuring key factors that determine needs for and outcomes of learning</li> <li>4. Support for experimentation</li> <li>5. Climate of openness</li> <li>6. Continuous education</li> <li>7. Variety of methods, procedures and systems that allows adaptation</li> <li>8. Multiple advocates at all levels to advance new ideas</li> <li>9. Involved leadership</li> <li>10. Interdependence of organizational units which leads to widespread accountability</li> </ol>
Goh (2003)	<ol style="list-style-type: none"> <li>1. Clarity of mission and vision</li> <li>2. Leadership commitment and empowerment</li> <li>3. Experimentation and rewards</li> <li>4. Effective transfer of knowledge</li> <li>5. Teamwork and group problem solving</li> </ol>
Chiva and Delorme (2004)	<ol style="list-style-type: none"> <li>1. Experimentation</li> <li>2. Risk taking</li> <li>3. Interaction with the external environment</li> <li>4. Dialogue</li> <li>5. Participative decision making</li> </ol>
Jerez-Gomez <i>et al.</i> (2005)	<ol style="list-style-type: none"> <li>1. Managerial commitment</li> <li>2. Systems perspective</li> <li>3. Openness and experimentation</li> <li>4. Knowledge transfer and integration</li> </ol>
Abu Khadra and Rawabdeh (2006)	<ol style="list-style-type: none"> <li>1. Learning and information sharing</li> <li>2. Vision and strategy</li> <li>3. Rewards and recognition</li> <li>4. Benchmarking</li> <li>5. Training</li> <li>6. Company performance</li> </ol>
Lin (2008)	<ol style="list-style-type: none"> <li>1. Managerial commitment</li> <li>2. Systems orientation</li> <li>3. Knowledge acquisition</li> <li>4. Knowledge dissemination</li> </ol>

**Table II.**  
Dimensions of  
organizational learning  
capability: an overview of  
the literature

Definition	Author
Product innovation consists of successful exploitation of new ideas	Myers and Marquis (1969)
Company innovation is defined as the taking up of an idea or behavior in relation to a product, service, instrument, system, policy or program that is new to the company	Zaltman <i>et al.</i> (1973) Damanpour and Evan (1984) Daft (1992)
Innovativeness is “the capacity and tendency to purchase new products and services”	Foxall (1984)
Innovation is the actual use of a nontrivial change and improvement in a process, product, or system that is novel to the institution developing the change	Slaughter (1998)
Organizational innovativeness is an organization’s overall innovative capability of introducing new products to the market, or opening up new markets, through combining strategic orientation with innovative behavior and process	Wang and Ahmed (2004)
Innovation is not a simple flash of inspiration but an extended and organized process of turning bright ideas into successful realities	Rowley (2010)

**Table III.**  
Definition of innovation

#### 4.2 Effect of organizational learning on organizational innovation

Although many works in the growing literature on organizational learning have noted a positive relationship between organizational learning and firm innovation (e.g. Tushman and Nadler, 1986; Calantone *et al.*, 2002; Chiva and Alegre, 2007; Alegre and Chiva, 2008), only a few researches has provided empirical evidence of positive relationship between OLC and firm innovation. Organizational learning supports creativities (e.g. Sanchez and Mahoney, 1996), inspires new knowledge and ideas (e.g. Damanpour, 1996; Dishman and Pearson, 2003), and increases ability to understand and apply them (e.g. Damanpour, 1996).

Tran (2008) noticed that some firms are better innovators than others because of the learning culture that is prevalent in the firm. Hurley and Hult (1998) focused on a large agency of the US federal government to show that organizational innovativeness was positively associated with a culture that emphasizes adaptation, innovation, and learning. Aragon-Correa *et al.* (2007) showed that OLC has a positive effect on firm innovation. Alegre and Chiva (2008) represents that OLC enhances product innovation performance.

Our proposed OLC measurement model has five dimensions: managerial commitment and empowerment, experimentation, interaction with the external environment and openness, knowledge transfer and integration and risk taking. The literature shows a positive association between the OLC dimensions and innovation. According to Thomke (2001), experimentation is a basic learning mechanism for a company to innovate; the development of a new product requires a number of experiments to test market and technology issues. New ideas and proposals represent the starting point of innovation (Koc and Ceylan, 2006). Risk taking is necessary for the generation of new ideas (Amabile *et al.*, 1996), and should therefore be tolerated in order to promote innovation. Learning also occurs through organizational interaction with the external environment. Customer demand uncertainty, technological developments and competitive turbulence are crucial environmental factors that

need to be monitored and analyzed (Wheelwright and Clark, 1992; Calantone *et al.*, 2002). External learning deriving from alliances and networks (Chang and Chee, 2003; Chipika and Wilson, 2006); technology transfers (Edmondson and Woolley, 2003) or R&D collaboration with universities and research institutes (Pedler *et al.*, 1997; Azagra-Caro *et al.*, 2006) might be a critical factor in the successful undertaking of innovation projects. Hence, interaction with the external environment represents another significant learning mechanism for innovation (Brown and Eisenhardt, 1995). Team member diversity, dialogue, and encouragement of communication make up the knowledge transfer and integration dimension. This learning mechanism may have a positive impact on innovation by exposing individuals to a greater variety of unusual ideas (Amabile *et al.*, 1996) and by increasing internal group cohesion and coordination (Brown and Eisenhardt, 1995). Finally, about managerial commitment and empowerment, everyone accepts that no objective can be obtained in a company without manager assistance, so for development of learning and innovation culture in organization, the manager should support and enhance commitment to learning and innovation through employee encouragement risk taking, having new idea, participating in decision making and problem solving.

These arguments lead us to our first hypothesis:

*H1.* Organizational learning positively influences organizational innovation.

## 5. Research synthesis

### 5.1 Organizational learning capability measurement

In this research, in order to develop an appropriate measurement scale to measure OLC in the Iranian Ceramic Tile Industry, three existing models were used, Goh, Chiva and Gomez to obtain a new model, having five dimensions. This five-dimensional model is verified through a 23 item questionnaire (Table IV). The OLC measurement instrument was applied using a five-point Likert scale, where 1 represented total disagreement and 5, total agreement. The pretest was assessed by 2 specialists to be assured that all questions are clear.

Dimensions of our proposed model include managerial commitment and empowerment, experimentation, risk taking, interaction with the external environment, and knowledge transfer and integration (Figure 1).

*5.1.1. Managerial commitment and empowerment.* Apparently, no objective can be obtained in a company without manager assistance. Most of the researchers hint directly or indirectly the leadership as an important element of promoting a learning culture, through behaviors, such as seeking feedback, being open to criticism, admitting mistakes, and empowering their employees to make decisions and take some risks (Goh, 2003). Law and Gunasekaran (2009) believed that there is a necessity for top management to drive and get commitments from all levels of organization to develop “Successful OL” (SOL) model.

Apparently, in order to establish learning culture in a firm, the manager should recognize the importance of learning, and then he will develop a culture that encourages the acquisition, creation and transfer of knowledge as fundamental sources of innovation (Quinn, 1985; Nonaka and Takeuchi, 1995). In other words, if a manager believes in the learning as a critical role in organization improvement, then their effort would be to facilitate learning and ensure that the employee become involved in creating, acquiring and transferring knowledge.



Dimension	Items	Literature source	Mean	SD	Standardized loadings	<i>t</i> -value
Managerial commitment and empower	CME	Banutu-Gomez (2004); Goh and Richards (1997)	2.98	1.32	0.75	7.84
	V1. In this organization, Managers frequently involve employees in important decisions.					
	V2. Policies are significantly influenced by the view of employees.	Chiva and Delorme (2004)	2.84	1.291	0.72	9.43
	V3. People feel involved in main company decisions	Chiva and Delorme (2004)	3.43	0.953	0.83	10.92
	V4. Employee learning is considered more of an expense than an investment.	Banutu-Gomez (2004)	2.94	1.16	0.54	6.83
	V5. Managers in this organization can accept criticism without becoming overly defensive	Goh and Richards (1997)	3.05	1.24	0.77	10.07
	V6. Senior managers in this organization resist change and are afraid of new ideas(r)	Goh and Richards (1997)	2.52	1.11	0.4	5.03
	EXP	Chiva and Delorme (2004)	2.85	1.16	0.9	4.1
	V7. People here receive support and encouragement when presenting new ideas					
	V8. Innovative ideas that work are often rewarded by management	Goh and Richards (1997)	3.15	1.10	0.8	12.15
Experimentation	V9. Experiences and ideas provided by external sources (advisors, customers, training firms, etc) are considered a useful instrument for this firm's learning	Banutu-Gomez (2004)	2.78	1.26	0.57	7.77
	V10. From my experience, people who are new in this organization are encouraged to question the way things are done	Goh and Richards (1997)	2.90	1.24	0.62	8.77

(continued)

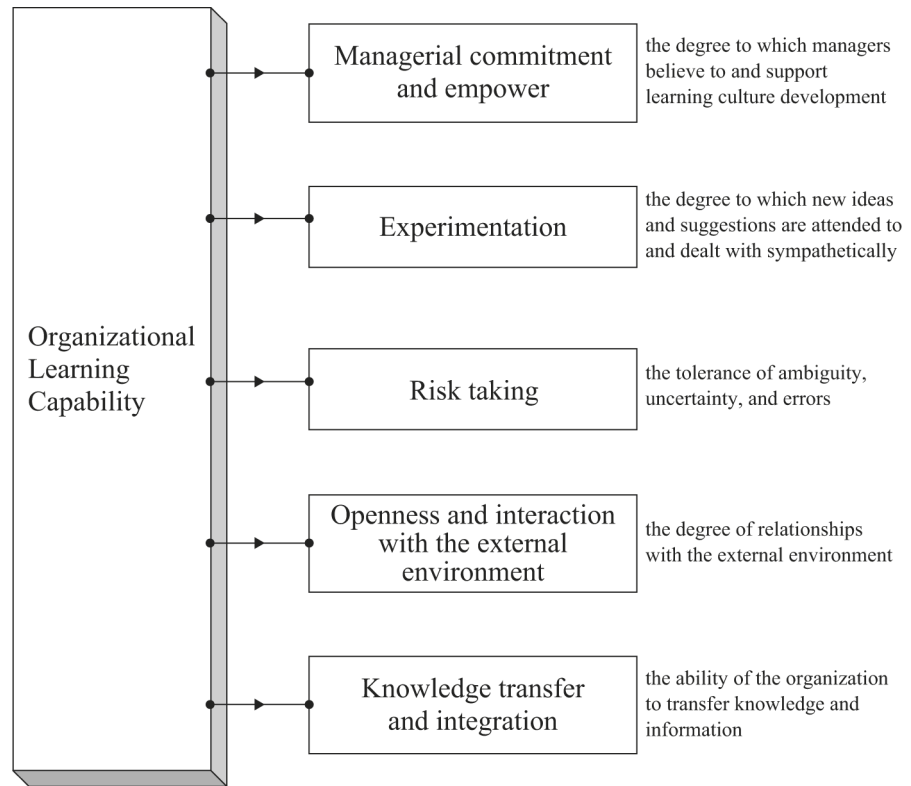
**Table IV.**  
Dimensions of organizational learning capability: an overview of the literature, SD, Mean, measurement loadings and *t*-value

Dimension	Items	Literature source	Mean	SD	Standardized loadings	t-value
Risk taking	RISK V11. People are encouraged to take risks in this organization	Chiva and Delorme (2004)	2.72	1.17	0.64	8.04
	V12. People here often venture into unknown territory	Chiva and Delorme (2004)	2.78	1.19	0.8	7.97
	V13. Senior managers in this organization tolerate risk and accept it's consequence		3.41	1.04	0.82	8.06
Openness and interaction with the external environment	ENV V14. There are systems and procedures for receiving, collating and sharing information from outside the company	Chiva and Delorme (2004)	3.18	1.18	0.35	9.91
	V15. People are encouraged to interact with the environment: competitors, customers, technological institutes, universities, suppliers etc	Chiva and Delorme (2004)	3.33	1.10	0.71	4.02
	V16. From my experience, this organization neglects strategies and progression of competitors(f)	Templeton <i>et al.</i> (2002)	2.82	1.07	0.37	3.15
	V17. It is part of the work of all staff to collect, bring back, and report information about what is going on outside the company.	Chiva and Delorme (2004)	2.94	1.21	0.45	3.48
	V18. From my experience, this organization accords new technology very late	Templeton <i>et al.</i> (2002)	2.44	1.27	0.34	3.04

(continued)

Dimension	Items	Literature source	Mean	SD	Standardized loadings	t-value
Knowledge transfer and integration	TI		2.15	1.16	0.51	8.59
	V19. In this organization, teamwork is a usual way to work		2.42	1.21	0.61	5.45
	V20. In this organization, employees are encouraged to communicate		2.94	1.20	0.43	4.38
	V21. Employees have the chance to talk among themselves about new ideas, programs, and activities that might be of use to the firm	Goh and Richards (1997), Chiva and Delorme (2004), Banutu-Gomez (2004)				
	V22. New work processes that may be useful to the organization as a whole are usually shared with all employees	Goh and Richards (1997)	2.55	1.29	0.72	5.97
	V23. The firm has instruments (manuals, databases, files, organizational routines, etc) that allow what has been learnt in past situations to remain valid, although the employees are no longer the same	Banutu-Gomez (2004)	3.06	1.11	0.58	5.32

Table IV.



**Figure 1.**  
The conceptual model of  
organizational learning  
capability (OLC)

In order to establish a supportive and participative cultural environment, the manager should enhance commitment to learning through employee encouragement risk taking, having new idea, participating in decision making and problem solving.

Consequently, it is expected that the management commitment and empowerment could help and facilitate organizational learning.

*5.1.2 Experimentation.* "Experimentation can be defined as the degree to which new ideas and suggestions are attended to and dealt with sympathetically" (Chiva and Alegre, 2009). If organizations want to be learning, it is necessary that they experiment new ideas and suggestion to learn from experience. Experimentation is a considerable resource for creative learning. A number of theorists (such as Garvin; Galer; Goh; Chiva; Gomez; AbuKhadra) have written specifically about the importance of experimentation in learning organizations. Lahteenmaki *et al.* (2001) discussed that if it is desired that learning be effective, four different kinds of abilities are required; one of them is active experimentation.

The organizations learn from experience either by strategic choice or by ageing (Child and Kieser, 1981). The experimentation dimension includes employees who want to learn and promote, continues training of them and supporting new ideas from internal or external.

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*5.1.3 Risk taking.* Risk taking can be understood as the tolerance of ambiguity, uncertainty, and errors (Chiva and Delorme, 2004). If organizations want to be learning, they should stand the risk of accepting new ideas. In other words, risk taking comprises possibility of mistakes and errors. Edmondson, Garvin and Gino considered the degree to which people feel able to take interpersonal risks as an important factor in creating learning climate. Sitkin went as far as to state that failure is an essential requirement for effective organizational learning, and to this end, examined the advantages and disadvantages of success and errors. According to his opinion, risk taking brings lots of benefits for firms (Chiva and Delorme, 2004).

*5.1.4 Openness and interaction with the external environment.* Close systems react slowly to the changes of the external environment, and can be successful when the economic environment remains static. These organizations do not need to learn. In order to respond to changes of the environment, as well as to create new opportunities, organizations must engage in activities aimed at both improving their existing products and services, and innovation.

This dimension is defined as the scope of relationships with the external environment. The external environment of an organization is defined as the factors that are beyond the organization's direct control. It consists of industrial agents such as competitors, and the economic, social, monetary and political/legal systems.

Environmental characteristics play an important role in learning, and their influence on the organizational learning has been studied by some researchers (Bapuji and Crossan, 2004).

Hedberg (1981) considered the environment as the prime mover behind organizational learning. According to Nevis *et al.* (1995), researchers in recent years have stressed on the importance of observing, opening up to and interacting with the environment (e.g. Goh and Richards, 1997).

The knowledge transfer, a fundamental aspect in the correct development of the organizational learning process, requires an environment that is willing to accept all types of opinions and experiences, both internal and external, and to learn from them (McGill *et al.*, 1993).

*5.1.5 Knowledge transfer and integration.* Nemeth identified leaning as a transfer of knowledge from an expert (teacher) to the learner (student).

The majority of authors cite in particular the ability of the organization to transfer knowledge and information as one of the most important factors of the OLC (Wick and Leon, 1993; Garvin, 1993; Bennet and O'Brien, 1994; Goh, 2003; Banutu-Gomez, 2004; Abu Khadra and Rawabdeh, 2006; Lin, 2008). Knowledge transfer implies the internal spreading of knowledge acquired at an individual level, mainly through debate, dialogue, communication and interaction between individuals (Jerez-Gomez *et al.*, 2005). Thus, dialogue, debate, team working and communication of employees are useful in transferring knowledge.

Indeed, communication cause information related to organizational problems and opportunities transfer across functional and structural boundaries within the organization. Transfer, gathering and interaction of knowledge and experience of individuals create a group of knowledge that is preserved in the organizations and others can use it.

### 5.2 *Measuring innovation in organization*

In order to be able to examine the effect of OLC on innovation, one should find a measurement tool to measure innovation. Regarding what mentioned former, the organizational innovation was considered as a multi-dimensional concept and proposed a measurement tool that includes Current Technology, R&D funding, Number of new or modified product introduced by firm, new or modified process that used by firm, number of new market that opened by firms or the number of new methods that firm use for marketing (Table V).

This survey was sent to the employees of the business session of 18 Iranian Ceramic Tile factories, to test our research model by confirmatory factor analysis approach.

## 6. Methodology

### 6.1 *Data collection*

Iranian ceramic tile industry has been selected as a context for data collection to test our OLC measurement scale. Ceramic tile production is a globalized industry and Iran is the eighth producer of ceramic tile in the world. Ceramic tile industry is growing so fast and it has become one of the most important industries in Iran. The questionnaires were addressed to employees at the business sector of each firm. With help of ISIRI (Institute of Standard and Industrial Research of Iran), 18 firms were selected and a total of 173 valid questionnaires were collected.

### 6.2 *Reliability*

Reliability is the ratio of the true score's variance to the observed variable's variance. Here, in order to perform a thorough reliability assessment, both the composite reliability values and the Cronbach's alpha coefficients was computed. The Cronbach's alpha coefficient of innovation questionnaire is 0.849, so is satisfactory. The composite reliability values and the Cronbach's alpha coefficients are also satisfactory for each subscale of OLC (Table VI).

To check whether the dimensions proposed are backed up by the results obtained from the study, a factor analysis was first made, using principal components extraction with oblique rotation, on the set of 23 items of the scale (see Table VI).

### 6.3 *Validity*

6.3.1 *Content validity.* Content validity refers to how adequately the magnitude analyzed has been described in the form of items (Nunnally, 1978). Unlike other types of validity, there is no definitive quantitative criterion by which to evaluate content validity (Hoskisson *et al.*, 1993), with the said evaluation being based on qualitative aspects. However, in our case, there are two possible indicators, which support content validity, namely:

- (1) the exhaustive overview of the literature; and
- (2) two specialists assessed our both questionnaires.

6.3.2 *Discriminant and convergent validity.* Convergent validity refers to how great the coincidence is among multiple measurements of the same magnitude using different methods (Hoskisson *et al.*, 1993). Convergent validity exists when a significant correlation is obtained among the variables that supposedly formed part of the construct being studied (Liden and Maslyn, 1998). In our case, there should be

Dimension	Item	Literature
Number of new or modified products, design or process	I1. In the last three years, how many kinds of new packages have been used in your company for packaging products?	Schumpeter (1934); Knowles (2007); Rogers (1998); Wang and Ahmed (2004)
	I2. In the last three years, how many new products have been produced in your company?	
	I3. In the last three years, how many products of your company have been improved?	
	I4. In the last three years, how many new or improved processes have been used?	
Number of new markets that opened by firm or new methods that used by firm for marketing	I5. In the last three years, how many new markets have been opened by your company?	Schumpeter (1934); Wang and Ahmed (2004)
	I6. In the last three years, how many new approaches have been used by your company for marketing (e-marketing, retail, wholesale trade, sales representative, ...)	
Current technology	I7. In the last three years, how new technologies have been used by your company for production?	Knowles (2007)
	I8. In the last three years, how new technologies have been used by your company for packaging?	
	I9. How many employees of your company have passed new technology training course?	
	I10. How much do employee of your company use internet in their jobs?	
R&D	I11. How much funding does your company devote to R&D every year (from your experience)?	Knowles (2007)
Freeman (1982)	I12. How much does your organization support and encourage R&D (from your experience)?	
	I13. How many of these activities (taking part in expert conferences, taking part in related society, taking part in national exhibition, taking part in international exhibition and etc) have your company taken part in?	

**Table V.**  
Shows innovation  
literature

significant correlations among the five subscales. Table VII shows that the correlations among the different subscales are significant, which corroborates the existence of convergent validity.

Discriminant validity among the latent variables and their associated measurement variables can be assessed by fixing (i.e. constraining) the correlation between pairs of constructs to 1.0, then re-estimating the modified model. This procedure essentially converts a two-construct model into a single-construct model. The condition of discriminant validity is met if the difference of the chi-square statistics between the constrained and standard models is significant (1 d.f.) (Hemsworth *et al.*, 2005). The chi-square difference tests indicated that discriminant validity exists among all of the constructs comprising the organizational learning capability (MCE, EXP, RISK, ENV, TI) ( $p < 0.01$ ) (see Table VII).

**Table VI.**  
Composite reliabilities, Cronbach's alphas, standardized loadings, and correlations between the dimensions of the OLC second order factor model

Concepts	Number of items	Cronbach's alpha	composite reliability	Standardized loadings	t-value	R <sup>2</sup>
MCE	6	0.823	0.857	0.92	10.2	0.84
TI	5	0.77	0.709	0.74	9.36	0.54
ENV	5	0.73	0.695	0.7	6.69	0.5
RISK	3	0.81	0.79	0.89	4.12	0.79
EXP	4	0.837	0.8	0.9	6.18	0.8
OLC	23	0.889	0.918			

**Table VII.**  
Assessment of convergent and discriminant validity of the constructs

	Correlation	Chi-square statistic		Difference	p-value		
		Unconstrained model $\chi^2$	Constrained model df				
<i>Managerial commitment and empower with:</i>							
Experimentation	0.71	174.6	35	57.7	34	116.9	0
Risk taking	0.91	208.8	27	165.8	26	40	0
<i>Openness and interaction with the external environment</i>							
Knowledge transfer and integration	0.8	161.5	44	108.3	43	43.2	0
<i>Experimentation with:</i>							
Risk taking	0.52	148.1	14	18.4	13	129.7	0
<i>Openness and Interaction with the external environment</i>							
Knowledge transfer and integration	0.66	105.3	27	47.6	26	57.7	0
<i>Risk taking with:</i>							
Openness and interaction with the external environment	0.59	141.8	27	54.5	26	87.3	0
<i>Openness and interaction with the external environment</i>							
Knowledge transfer and integration	0.64	96.6	20	49.2	19	47.4	0
<i>Knowledge transfer and integration with:</i>							
Openness and interaction with the external environment	0.68	193.5	22	140	21	53.5	0
<i>Openness and interaction with the external environment</i>							
	0.87	207.1	36	105.3	35	101.8	0



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#### 6.4 Survey results

Broadly speaking, there are two basic problems that are important in the social and behavioral science. One of these problems is concerned with the measurement properties – validities and reliabilities – of the measurement instruments. The purpose of a measurement model is to describe how well the observed indicators serve as a measurement instrument for the latent variables. Growing number of researchers are adopting Confirmatory Factor Analysis (CFA), a particular analysis of structural equations modeling, as a mean of statistical analysis to check the goodness-of-fit of the measurement scales. CFA has been used to test the psychometric properties of measurement scales in a number of studies; e.g. only in organizational learning research more than ten academic articles published in Elsevier, ScienceDirect, Emerald Insight have used CFA for data analysis (e.g. Alegre and Chiva, 2008; Argyris and Schon, 1996; Carmines and McIver, 1981; Chiva and Alegre, 2008; Freeman, 1982) and this method is recommended by Montoya-Weiss and Calantone (1994) in order to assess construct validity and reliability of subjective measurement instruments.

The psychometric properties of the measurement scales are assessed in accordance with accepted practices (Gerbing and Anderson, 1988) and included the establishment of scale dimensionality, reliability and validity.

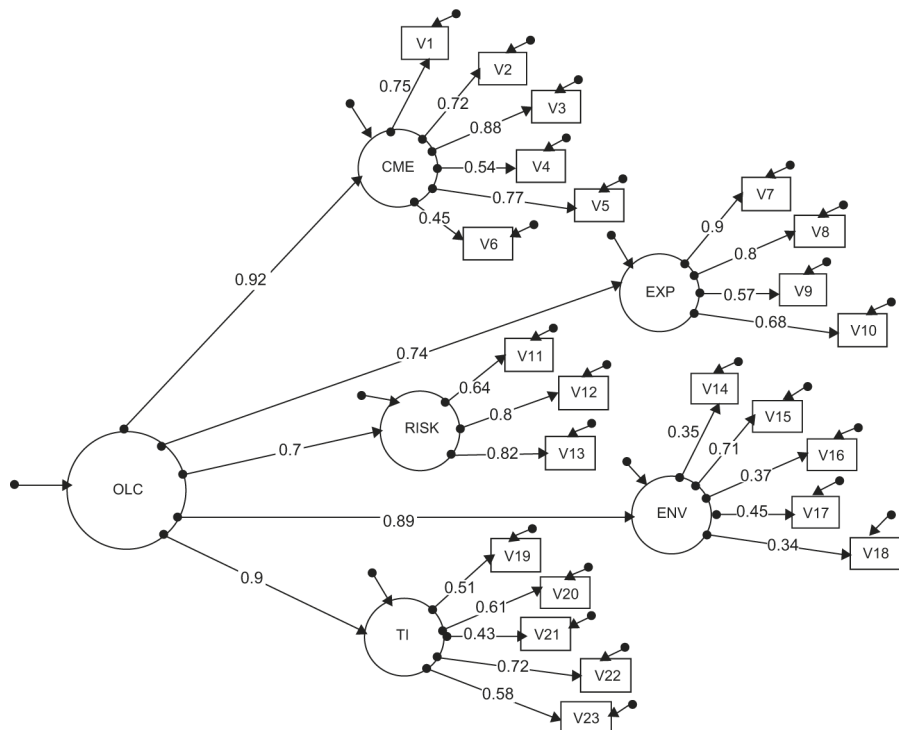
This method also provides the correlations between factors or dimensions and the construct of interest (Fornell and Larcker, 1981; Anderson and Gerbing, 1988).

Therefore, Structural Equation Modeling (SEM) can be employed to evaluate the dimensionality of measurement scales through CFA. SEM is a multivariate statistical analysis technique, which is used to analyze structural relationships between measured variables and latent constructs and is the combination of factor analysis and multiple regression analysis. Based on theory, such analysis allows the researcher to priori establish the number of latent variables and the relationships between them and the observable variables (Hair *et al.*, 1998).

Here OLC concept was considered as a second order factor that consists of five dimensions, Managerial commitment and empowers (MCE), experimentation (EXP), risk taking (RISK), openness and interaction with the external environment (ENV), knowledge transfer and integration (TI) (Figure 2). In this paper the OLC measurement instrument is applied using a five-point Likert-type scale, where 1 represents total disagreement and 5, total agreement.

In this research, Lisrel 8.7 software was used to analyze our model and Figure 2 shows the relationship between OLC parameters and path coefficient that is satisfactory, the factor loadings are high enough.

In additional, Lisrel creates some indices that show the goodness of model. The produced fit indices, suggest a good overall fit (see Table VIII); The  $\chi^2$  statistic was not used because of its sensitivity to the large sample size. Instead, the ratio of  $\chi^2$  to degrees of freedom (df) was used, and a value of 1.65 was obtained, which is within the suggested value of 3 (Carmines and McIver, 1981), it is between 1 and 2, which indicates an excellent parsimonious fit (Joreskog and Sorbom, 1993). The Comparative Fit Index (CFI) is another index of fit with values typically ranging from 0 to 1. Values greater than 0.9 represent reasonable models of fit (Seyal *et al.*, 2002). For the research model, value of 0.96 was observed for CFI, which indicated a good model fit. Other indices like normed fit index (NFI), NNFI, Incremental Fit Index (IFI) and Relative Fit Index (RFI) exceed the recommended acceptance threshold of 0.9. Finally, root mean



**Figure 2.**  
Results of structural  
equation model

**Notes:** Chi-Square = 372.7; d.f = 255; P-value = 0; RMSEA = 0.062

square residual (RMSR) provides an indication of the proportion of the variance not explained by the model, whereas root mean square error of approximation (RMSEA) describes the discrepancy between the proposed model and the population covariance matrix. For the research model, values of 0.065 and 0.062 for RMSR and RMSEA were observed, respectively, which was within the recommended cut-off values of 0.10 (RMSR) and 0.08 (RMSEA) for a good fit (Byrne, 1998). Therefore, it is concluded that the overall research model was a good fit.

### 6.5 OLC and firm innovation

In this paper, the Chi-Square hypothesis test in SPSS16 Software was used to examine the relationship between OLC and firm innovation, where the null hypothesis, *H<sub>0</sub>*, is that there is no relationship between them and the alternate hypothesis, *H<sub>1</sub>*, is that they are correlated.

Chi-Square hypothesis test result shows that the null hypothesis is rejected, so OLC and firm innovation are dependant. Table IX shows the correlation between organizational learning and organizational innovation that is positive and satisfactory. Thus OLC has positive and significant effect on firm innovation.

A further step was also taken towards testing the relationship between each dimension of OLC and firm innovation. The Chi-square hypothesis test in SPSS16 Software was used to examine the relationship between each dimension of OLC and

Chi-square/df	<i>p</i> -value	GFI	RMSEA	NFI	NNFI	IFI	CFI	RFI	Fit indices
1.65	0.000	0.84	0.062	0.91	0.95	0.96	0.96	0.9	Result of model Appropriate value
<3	<0.01	Close to 1	<0.1	>0.9	>0.9	>0.9	>0.9	>0.9	

**Table VIII.**  
Result of confirmatory  
analyses for the OLC  
construct

**Table IX.**  
Correlation between OLC  
and organizational  
innovation

	OLC	Innovation
<i>OLC</i>		
Pearson correlation	1	0.814*
Sig. (two-tailed)		0.000
<i>n</i>	18	18
<i>Innovation</i>		
Pearson correlation	0.814*	1
Sig. (two-tailed)	0.000	
<i>n</i>	18	18

**Note:** \*Correlation is significant at the 0.01 level (two-tailed)

firm innovation; results show that firm innovation is dependant to each dimension of OLC. Table X shows the correlation between organizational innovation and each dimension of OLC, which is positive and satisfactory.

### 7. Conclusion and implications

Innovation is generally considered to be one of the key drivers of corporate success (Kamal, 2006). Both researchers and practitioners have accepted the innovation as a key factor to survive companies in fast changing environment. Thus, it is important to find organizational conditions that enhance firm innovation. The close context of innovation and OLC motivate scholars to consider the possibility of significant impact of OLC on the innovation. However, numerous scholars agree that organizations with learning culture are more innovative, but there are only a few empirical researches that investigated this subject. To examine the effect of OLC on the innovation, at first an appropriate measurement scale must be found to measure OLC. Therefore in this study, two purposes was aimed; first, a scale for measuring organizational learning capability was developed and validated that allows the different dimensions forming this capability to be identified. Second, a further step was taken towards testing the relationship between OLC and firm innovation. Our study provides evidence to back up a kind of relationship between a firm innovation and its learning capability.

Although OL is, at present, a very popular theme in business administration, this concept is still ambiguous. Unlike the OLLO literature stressing on diagnosis of facilitative parameters of OL, the lack of valid OLC measurement is still obvious. The OLC measurement instrument, which aims to capture the organizational propensity to learn, is based on a comprehensive analysis of the facilitating factors for organizational learning. In this paper, relying on some other scholars who also have recognized

**Table X.**  
Correlation between each  
dimension of OLC and  
organizational innovation

	CME	TI	ENV	EXP	RISK	OLC
<i>Innovation</i>						
Pearson correlation	0.416	0.616**	0.656**	0.462	0.625	0.814**
Sig. (two-tailed)	0.008	0.006	0.003	0.000	0.003	0.000
<i>n</i>	18	18	18	18	18	18

**Note:** \*Correlation is significant at the 0.01 level (two-tailed)

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similar problem areas in OL research, in this research was tried to represent an initial testing and validation of the organizational learning capability scale, within one industry and nation. The developed measurement scale consists of five dimensions: managerial commitment and empower, experimentation, risk taking, openness and interaction with the external environment, and knowledge transfer and integration. These dimensions represent an important contribution to the literature on OL, as they are based on an exhaustive literature review, and they have also been statistically validated by the research presented here.

The questionnaire was administered to the employees of business section of Iranian ceramic tile manufacturers, in order to obtain a homogeneous set of respondents. Our model was empirically tested and validated by CFA using the Lisrel 8.7 software. In the validation process, both the principal components and the CFA clearly corroborate the existence of the five dimensions mentioned in the theoretical work. The second-order factor analysis provides an empirical backing to the proposed organizational learning structure model, in which learning is considered to be a latent construct that lies under five dimensions, which are also latent and which are measured using different observable variables. The scale has behaved well in the statistical analysis carried out to check for the presence of convergent and discriminant validity.

In the second step, the relationship between the OLC and firm innovation was analyzed. The literature also greatly supported the hypothesis that the OLC and even each of its five dimensions have a positive correlation with the organizational innovation. The relationship between OLC and each of its dimensions with the firm innovation was tested by Chi-square hypothesis test and Pearson correlation using SPSS 16. The results show that OLC has a positive and significant effect on the firm innovation.

Therefore, our study makes a contribution to the literature by supporting the perspective that OLC affect on firm innovation. Thus it shows the importance of learning culture development to improve firm innovation. Findings have important implications in the field of organizational learning and knowledge management. This research first provides a valid OLC measurement. The OLC measurement scale is useful for practitioners. Metrics must provide key business drivers for decision makers to examine the outcomes of various measured processes and strategies and track the results to guide the company. The OLC measurement scale may be used as a diagnostic tool, a device for a survey-feedback procedure towards organizational development.

Second, this research provides empirical evidence that OLC enhances firm innovation. This finding is important for both academics and practitioners. Practitioners should take the five dimensions into account when setting their companies' innovation objectives. The OLC measurement instrument could also be used for audit purposes to assess the firm's own evolution over time or to evaluate suppliers whose participation in the innovation process could be relevant.

### *7.1 Practical implications*

The results of this study provide useful information that could be used to make improvements in organizational practices. At first, this study contributes to organizational learning research by providing a valid and reliable operational measure that is expected to help researchers in future theory testing. The proposed

measurement scale for organizational learning capability could be implemented as an audit tool. Thus, managers could unveil which organizational learning issues are strong and which are weak. This would provide guidance for improvement. Second, this valid measurement instrument shows that if the managers want to improve organizational learning they should enhance commitment to learning through employee encouragement risk taking, having new idea, participating in decision making, debate, team working, and problem solving.

The most important implication is that firm innovation is affected by the organizational learning. Therefore, when seeking to improve firm innovation, practitioners should take into account the enhancement of learning culture in the organizations.

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