

*Full Length Research Paper*

# Organizational learning in the petrochemical industry: A case study of Kermanshah Petrochemical Company

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In the year 2002, Templeton, Lewis and Schneider provided (design) a model of (for) designing organization measurement. "Organization learning is the collection of achieving, offering and interpreting knowledge as well as related information and therefore improving the organization's memory that results in positive organization changes knowingly and unknowingly". This research takes advantages of the Templeton model. The main aim of this project is to measure (and) analyze the level of organization learning and offer ways of promotion in Kermanshah Petrochemical Company. For the comparison between two separate society women and men, comparison between the employee with bachelor degree and that with MA, and the comparison between Kermanshah Petrochemical Company and 119 American companies have been done with the Mann-Whitney Test. For the comparison between two separate society employees with different experience and age, the Kruskal-Wallis Test was used. Confidence interval based on T-test was used to measure the difference between value of organizational learning factors and favorable average value. Thus, Mann-Whitney Test was employed for the purpose of comparison between two separate companies (that is, Kermanshah Petrochemical Company and 119 American companies). Eventually, the comparison between Kermanshah Petrochemical Industries Company and the average 119 American Companies as two separate society's companies shows that there is no considerable difference between them.

**Key words:** Organizational learning, learning organization, Iran Petrochemical Industry.

## INTRODUCTION

In recent years, the study and analysis of organizational learning has increased in importance, and several numbers of researchers have employed a variety of approaches in analyzing it (Jerez-Gómez et al., 2005). Among those approaches, psychological (for example, studies), social (Cyert and March, 1963; Daft and Weick, 1984; Cangelosi and Dill, 1965; Nelson and Winter, 1982) and organizational approaches (Huber, 1991; Nonaka et al. 1994; Grant 1999) are to be mentioned (Jerez-Gómez et al., 2005).

Organizational learning has lately been considered mainly from the strategic perspective. From this perspective, it is thought to be a source of drawing distinction between organizations and also a basis for creating a competitive advantage. Being chiefly considered from the strategic perspective, organizational learning is thought to be a source of drawing distinction between organizations and also a basis for creating a competitive advantage (Lei et al., 1996; Goh and Richards, 1997; Lei et al., 1999). As a matter of fact, the concept of learning organization originally comes from causing changes brought about in traditional business management methods (Jerez-Gómez et al., 2005). Although organizational learning has been broadly investigated, there are still great deals of aspects to be studied. It is on the one hand,

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widely accepted that organizational learning is an essential element to successful competition in global market despite few studies carried out in the field (Jerez-Gómez et al., 2005), but on the other hand, organizational learning should be measured and proved through experimental tests in order to generalize theories, notwithstanding deep case studies done in the field of inherent complexity of organizational learning structure (Jerez-Gómez et al., 2005). Therefore, it could be of great use to study and build a multidimensional structure by applying numerous researches and then examine them. Therefore, it seems necessary to study and investigate the Iranian organizations and companies for the obstructive factors detection and the progress strategies development in order to take cumulative steps toward a learning organization. Otherwise, Iranian companies, petrochemical companies in particular, will not be able to survive in the highly stiff competition that comprised Arab companies (especially the ones in Arabia and Qatar) and also Russian companies in the not too distant future. Thus, the organizational learning degree, the corresponding effective factors and the development strategies have become of essential concern for petrochemical companies officers.

Organizational learning capability is an intricate multidimensional construct of different dimensions or components that are been identified by a large variety of studies. Goh's and Richards' (1997) study identifies five dimensions including clarity of purpose and mission, leadership commitment and empowerment, experimentation and rewards, transfer of knowledge, teamwork and group problem solving, and it establishes a learning scale made up of 21 items.

Hult and Ferrell (1997) carried out a more comprehensive study with regard to the validation of the scale formed by 23 items which evaluate organizational learning capability (team orientation, systems orientation, learning orientation and memory orientation).

Templeton et al. (2002) came to a conclusion that organizational learning consist of awareness, communication, performance assessment, intellectual cultivation, environmental adaptability, social learning, intellectual capital management and organizational grafting.

The literature review shows that various studies are carried out in the area of the measurement of organizational learning and different statistical models are introduced accordingly. Also, almost all researches are performed in the context of manufacturing companies (Tjepkema et al., 2000; Jerez-Gómez et al., 2005; Alegre and Chiva, 2008).

The purpose of this paper is to introduce a tool for measuring and analyzing levels of organizational learning in Kermanshah Petrochemical Company. Thus, the paper primarily proceeds with studying and investigating the learning organization and organizational learning and its related concepts, after which it proceeds with the methodology. Subsequently, the results of the study are given followed by discussion and conclusion, respectively.

## LITERATURE REVIEW

### Learning organization

The concept of the learning organization, most often attributed to Senge (1990) Learning Organization (LO), which is "...an organization that is continually expanding its capacity to create its future" (Senge and Kurpius, 1993), is about the identification of characteristics of organizational culture and climate that develop a learning culture. Johnston and Hawke (2001) explained a learning culture as: the set of attitudes, values and practices within an organization which support and encourage a continuing process of learning for the organization and/or its members. Tjepkema et al. (2002) defined that description of a learning organization makes use of the learning of all employees, while Yeo's (2005: 375) general study review of the concept deduced that it is based on a belief that the collective learning of the organization's members will result in increased improved organizational performance and competitive advantage. All of these definitions emphasize the role of the employees.

### Organizational learning

There are many definitions of OL in practice and research which creates confusion. "OL means the process of improving actions through a better knowledge and understanding" (Fiol and Lyles, 1985). In 1900 AD, when Frederick Taylor introduced the subject of learning transfer to other staff in order to increase efficiency and improve the organization, the concept of organizational learning was formed. However, in 1963, Ci Rychart Yrt and James March were the first people who combined the two words together, learning and organization, and introduced learning as an organizational phenomenon (Senge and Kurpius, 1993).

Scholars from different disciplines, such as psychology, sociology, information systems and management have defined and examined organizational learning in different ways (Bapuji and Crossan, 2004). Organizational learning appears in the form of total productivity of the learning curve results (Adler, 1990). The flow of learning possibilities is derived from the multiplicity of connections among practitioners in a community that engage with constant reconfiguration of their (learning) practices (Antonacoupoulou and Chiva, 2007).

"Organizational learning is the set of actions (knowledge acquisition, information distribution, information interpretation and organizational memory) within the organization that intentionally and unintentionally influence positive organizational change" (Templeton et al., 2002).

### Types of learning

There are many different types of learning that may impact

OL. Argyris and Schon (1978) are largely responsible for elevating and heightening the awareness of learning specific to organizations and defining different types of learning, namely: single-loop, double-loop and deuterio-learning. Single-loop learning is principally concerned with referring to a specific problem resolution, inclined to be immediate. It would be uncommon to search extensively for a solution in single-loop learning (Argyris and Schon, 1978). Fiol and Lyles (1985) refer to this type of learning as "lower-level" learning with the direct impact on a special act within the organization.

Double-loop learning transcends the immediate and may be composed of changes in organizational norms (Argyris and Schon, 1978). This is referred to as higher-level learning by Fiol and Lyles (1985) and is more involved with a broad overview against the specific activities that resolve a situation.

Finally, deuterio-learning checks the methods or strategies for learning, evaluating and generalizing the development of a new process which is then returned in OL practice (Argyris and Schon, 1978).

## METHODOLOGY

Templeton et al. (2002) designed an instrument to specifically measure the construct of OL. They considered eight factors (Table 1) and 28 items for OL assessment derived from a sample of 119 knowledge based firms. The results from this study may be used as a benchmark to measure an organization's level of OL. For example, organizations that would score above these standards may be considered in learning organizations and organizations that score below may need to estimate their resources in the areas of the identified OL dimensions (Templeton et al., 2002). The investigative factor analysis was used in eight dimensions to describe OL:

1. Awareness: "The extent to which organizational members are aware of the sources of key organizational information and its applicability to existing problem areas."
2. Communication: "The extent of communication that exists between organizational members."
3. Performance assessment: "The comparison of process and outcome related performance to organizational goals."
4. Environmental adaptability: "Technology-related items pertaining to organizational responses and environmental change."
5. Intellectual cultivation: "The development of experience, expertise and skill among existing employees."
6. Social learning: "The extent to which organizational members learn through social channels about organizational concerns."
7. Intellectual capital management: "The extent to which the organization manages knowledge, skill and other intellectual capital for long-term strategic gain."
8. Organizational grafting: "The extent to which the organization capitalizes on the knowledge, practices and internal capabilities of other organizations" (Templeton et al., 2002).

According to Templeton model, OL questionnaires were distributed among 36 people from senior managers, middle managers and some operational managers of the Petrochemical Industries Company. According to Templeton model, the OL questionnaire includes 28 items for which there is one question as shown in Appendix 2 at the end of this paper. The validity of the questionnaire used in this study has also been investigated by its designers according to what follows; whereas the initial questionnaire which,

in fact, represents the activities carried out in a learning organization, has been consigned to the experts in the field of organizational learning and the magnitude of the reliability calculated by Cronbach alpha formula has been obtained as 0.89. Comparing the current and desired situation with 36 people,  $n$  was larger than 30 based on the big sample deduction, while the sample mean distribution was normal according to the central limit theorem (CLT). Thus, a confidence interval based on T test can be used. The questionnaires were distributed among 36 operational managers of the Petrochemical Industries Company. The validity of the questionnaire used in this study has also been investigated by its designers, while the initial questionnaires which represent the activities carried out in a learning organization have been sent to 6 experts who work on organizational learning in different industries. The experts were asked to specify the relations between activities and OL in the form of: (1) unrelated, (2) relatively related, and (3) related. The CVR was calculated for each question individually and the results of the questions which showed that CVR was less than 5% were removed.

Since the questionnaire has been translated, it is necessary to measure its reliability. The magnitude of the reliability calculated by Cronbach's alpha formula has been obtained as 0.89. Since  $N$  (36) was obtained larger than 30, the sample mean distribution was normal according to the central limit theorem (CLT). Therefore, the confidence interval based on T-test can be used in order to compare the mean magnitude of 8 factors of OL in Kermanshah Petrochemical Company with desirable situation (Table 3).

Mann - Whitney test has been used to compare the current situation with the situation of 119 U.S (Table 4) companies and to study the status of two independent communities. The step-by-step regression has been used to rate indices affecting organizational learning.

## RESULTS

Appendix 1 shows the results collected from the questionnaire. The desirable level in this test is taken by number 4 which is considered as quintuple borrowed from the binomial test (for binary data such as Yes or No) of the middle of the top half of the Likert spectrum. In other words, score 16 of the 20 level is considered as desirable. However, the mean of organizational learning with 95% confidence level is shown in Table 2.

5----- 4-----3-----2-----1-----

Studying the results with 95% confidence level (Table 3) shows that the significant difference can only be seen between two indices of social adjustment and the learning atmosphere of the social learning environmental adaptability with favorable conditions.

The comparison (Table 4) suggests that this company is in a desirable condition when compared to the average of the American companies. This is quite a descriptive standpoint borrowed from comparing two average amounts. However, Mann-Whitney test comparison provides us with the following data (Tables 5 and 6).

Fundamentally, the amount of  $\alpha$  has been obtained as 26 from Mann-Whitney.

## DISCUSSION

This study aims at measuring the level of organizational

**Table 1.** The factors of organizational learning by Templeton et al. (2002).

Factors of OL	Definition
1) Awareness	“The extent to which organizational members are aware of the sources of key organizational information and its applicability to existing problem areas”
2) Communication	“The extent of communication that exists between organizational members”
3) Performance assessment	“The comparison of process and outcome related performance to organizational goals”
4) Environmental adaptability	“Technology-related items pertaining to organizational responses and environmental change”
5) Intellectual cultivation	“The development of experience, expertise and skill among existing employees”
6) Social learning	“The extent to which organizational members learn about organizational concerns through social channels”
7) Intellectual capital management	“The extent to which the organization manages knowledge, skill and other intellectual capital for long-term strategic gain”
8) Organizational grafting	“The extent to which the organization capitalizes on the knowledge, practices and internal capabilities of other organizations”

**Table 2.** Mean of organizational learning with 95% confidence level.

Std. deviation	Mean	High level	Low level	Result
0.49	3.74	4.08	2.38	

**Table 3.** Mean of organizational learning factors with 95% confidence level.

Mean	High level	Low level	Factors
3.78	4.3	3.27	Awareness
4	4.35	3.65	Communication
3.98	4.24	3.72	Performance assessment
3.92	4.26	3.57	Intellectual cultivation
3.46	3.82	3.1	Environmental adaptability
3.11	3.51	2.71	Social learning
3.78	4.19	3.36	Intellectual capital management
3.92	4.34	3.49	Organizational grafting

learning, comparing those factors mentioned in the Templeton survey with 119 American companies and finally ranking the factors in Kermanshah Petrochemical Company. Since N (36) was larger than 30, the sample mean distribution was normal according to the central limit theorem (CLT). Therefore, the confidence interval based on T-test can be used in order to compare the mean magnitude of the 8 factors of OL in Kermanshah Petrochemical Company with the desirable situation. This interval was calculated with 95% confidence as shown in Table 4. In order to measure organizational learning with

95% confidence, binomial test was used. The mean of the lower and higher levels was obtained (Table 2) as 2.38 and 4.08, respectively. For the fact that the mean magnitude of six factors (awareness, communication, performance assessment, intellectual capital management and organizational grafting) was located in the interval, Kermanshah Petrochemical Company was considered desirable in terms of these six factors (Table 4). However, the average amount of the two factors (social learning and environmental adaptability) was not located in the interval. As a result, Kermanshah

**Table 4.** The average of the Petrochemical Company compared with that of the 119 U.S. companies mentioned by Templeton via Mann-Whitney test.

Factor	The result of the research from 119 American companies		Kermanshah Petrochemical Company
	Std. deviation	Mean	Mean
Awareness	0.76	3.9	3.78
Communication	0.69	4.53	3.99
Performance assessment	0.81	3.55	3.97
Intellectual cultivation	0.87	3.94	3.91
Environmental adaptability	0.85	3.63	3.45
Social learning	0.83	3.9	3.11
Intellectual capital management	0.79	4.01	3.77
Organizational grafting	0.9	3.82	3.91
Organizational learning	0.73	3.91	3.75

**Table 5.** Test statistics.

Sum of rank	Mean rank	N	VAR2	VAR1
74	9.25	8	USA	VAR1
62	7.75	8	IRAN	
		16	result	

**Table 6.** Mann-Whitney Test.

1 VAR	
26	MANN-WHITNEY U
62	WILCOXON W
632	Z
0.582	ASYMP.SIG.(tailed)

Petrochemical Company was not desirable with regard to these two factors. The amount of  $\alpha$  was obtained as 26 from Mann-Whitney as shown in Table 6. This value analyses show the equality assumption of the average of amount of the two communities (Kermanshah Petrochemical Company and 119 US companies in Templeton). The significant number value should be considered in order to analyze the assumption of the equality of the two communities. With the amount of significant difference, the value is smaller than 0.05. The difference assumption is rejected and that of equality is proved by the average amount of the two communities which becomes considerable. Altogether, it is confirmed that the indices factors of this company have no significant difference and are almost equal with the mean value of the 119 U.S. companies (Templeton et al., 2002).

Rating indices in order of importance influences organizational learning according to step by step regression, which is as follows:

1. Intellectual capital management.

2. Intellectual cultivation.
3. Awareness.
4. Social learning.
5. Performance assessment.
6. Environmental adaptability.
7. Communications.
8. Organizational grafting.

### Conclusion

With the results obtained from this research and comparing them to the status of the 119 U.S. companies, it can be concluded that Kermanshah Petrochemical Company is in a desirable level of organizational learning and is trying to create dynamism in the company through introducing suitable facilities for the employees to learn. If we take for granted that the survival of companies in today's competitive environment depends on organizational learning, then there will be conditions in the company in case of implementation of the programs causing an increase in organizational learning, so that the

presence of experts, specialists, intelligent and motivated people can be continuously exploited. Results from findings suggest that Kermanshah Petrochemical Company shows no significant difference in the six indices (intellectual capital management, knowledge intellectual cultivation, awareness, performance assessment, organizational grafting and communications), but shows a considerable difference in social learning and environmental adaptability. Thus, the priority of these indices factors are as follows: intellectual capital management, intellectual cultivation, awareness, social learning, performance assessment, environmental adaptability, communications and organizational grafting.

Assuming that the survival and progress of organizations is dependent upon the persistence of innovation and learning, it is necessary to evaluate the level of organizational learning. For future researches, it can be proposed that organizational learning should be evaluated for all companies working in the competitive atmosphere so that the average level of organizational learning is obtained in Iran. It is preferable to measure the level of organizational learning in each industry so that it is possible to re-evaluate and compare it to that of past years. Finally, it will be possible to find an inclusive program to improve organizational learning in Iranian companies and implement it in order to increase the abilities of Iranian rival companies in the global market.

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**Appendix 1.** The results of 'organizational learning' factors in Kermanshah Petrochemical Company.

Variance	Std. deviation	Median	Mean	Number	Factors
0.66	0.81	4	3.78	36	Awareness
0.3	0.55	4	4	36	Communication
0.16	0.41	4	3.98	36	Performance assessment
0.3	0.55	4	3.92	36	Intellectual cultivation
0.32	0.56	3.63	3.46	36	Environmental adaptability
0.39	0.62	3.17	3.11	36	Social learning
0.43	0.66	4	3.78	36	Intellectual capital management
0.45	0.67	4	3.92	36	Organizational grafting

**Appendix 2.** Templeton et al. (2002) factors and items.

Factors and terms
<p><b>Awareness</b></p> <p>When employees need specific information, they know who will have it.  Management monitors important organizational performance variables.  Management proactively addresses problems  Top management integrates information from different organizational areas  Employees are keenly aware of where their knowledge can serve the company</p>
<p><b>Communication</b></p> <p>Employees use electronic means to communicate.  Employees have a large variety of communication tools (telephone, email, internet and so on).  Employees are encouraged to communicate clearly.</p>
<p><b>Performance assessment</b></p> <p>The company collects data on all facets of performance.  The company stores detailed information for guiding operations.  There is a formal data management function in the company.  Management encourages the use of framework and models to assist decision-making.</p>
<p><b>Intellectual cultivation</b></p> <p>The company develops experts from within.  Management learns from the company's partners (such as: customers, suppliers and allies).  Management assigns employees to other parts of the organization for cross training.  Management learns new things about the company by direct observation.</p>
<p><b>Environmental adaptability</b></p> <p>Employees make extensive use of IS to support their work.  The company makes extensive use of electronic storage (such as: databases, data warehousing and scanned documents).  The company is slow to react to technological change. (-)  Employees retrieve archive information when making decisions.</p>
<p><b>Social learning</b></p> <p>Employees keep information (such as, numbers, plans and ideas) from other employees. (-)  Our employees resist changing to new ways of doing things. (-)  Employees learn about the company's recent developments through informal means (such as: new stories and gossip). (-)</p>

**Appendix 2.** Contd.

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**Intellectual capital management**

The company acquires subunits (such as: organizations, functions and departments) based on short-term financial gain. (-)

The company maintains a certain mix of skills among its pool of employees.

The company hires highly specialized or knowledgeable personnel.

**Organizational grafting**

Management ignores the strategies of competitor's top management. (-)

When internal capabilities are deficient, we acquire them from outside

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