A Study on the Success of Knowledge Management in the Country's Petrochemical Industry Using the AHP Technique - Case Study: Shazand Petrochemical Company

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1. Introduction

In recent decades significant changes in the business environment changed the focus of organizations from tangible assets to intangible assets which among them knowledge is one of the most important. Knowledge management in organizations has been registered as a useful activity at least 18 years ago [1] and existed for many years -probably centuries- before that. However, many organizations -or rather their directors- still, consider achieving knowledge management a hard fight, especially when it comes to implementing the plans set before.

One of the problems of Iranian organizations is the implementation of knowledge management processes. Studies have shown that some of the implementation barriers are related to the lack of relevance of knowledge management programs and their sub-elements with large-scale programs and in other words, organizations strategies. The alignment of knowledge management programs with organizational strategies, since the knowledge management itself becomes an

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organizational perspective, also facilitates the implementation of knowledge management in addition to ensuring that knowledge management is implemented [2].

AHP technique, as it has the ability to deal with multi-criteria decision-making issues, also provides a method for measuring qualitative scales based on priorities, enabling managers to make effective decisions on complex issues by accelerating the decision-making process (the same source). The other benefits of AHP include not only the possibility of simultaneously incorporating various quantitative and qualitative scales which affect the mixed elements of the marketing, but also the ability to estimate, predict and investigate the alteration of marketing mixed elements for the company's marketing manager. It is considered as a tool for participation in the mineral water production and packaging industry and will lead the company to achieve more market share among competitors [3].

2. Literature overview

Once organizations were looking for data and information, but today they are facing a huge amount of data and information, which in many cases managing and using them yet is another problem. Nowadays, organizations increasingly diverge on the basis of their own knowledge, and in fact, knowledge can be considered the greatest competitive advantage of organizations in the global economy. Today, intellectual assets, as a powerful force, are being used instead of physical assets. Knowledge (knowledge based on experience) is a key resource in any organization. The more someone knows, the better he/she can do. In today's world, knowledge is considered not only as an asset but also as the most important asset for organizations. Therefore, the same as the management of physical resources such as money, knowledge management should be part of the organization's standard policies. Knowledge management refers to the systematic use of knowledge in an organization and using it in activities, in order to realize the goals and objectives of the organization (the same source).

A lifelong organization should be able to take advantage of opportunities, resist environmental tensions and eliminate threats. Relying on the strengths of the organization and reducing weaknesses is an essential requirement of an effective work strategy plan. In recent years, knowledge management has been considered as an internal advantage and strength of the organization for updating, enhancing the competitive ability and having dynamic organizations.

Knowledge management is an interdisciplinary concept that has attracted the attention of researchers and organizations in Iran in the recent decade. Knowledge management refers to any kind of activity that focuses on the experience and mental knowledge of individuals so that they can contribute to the knowledge through sharing and disclosure. Increasing knowledge together can relate to common knowledge producing. This sharing in the creation of knowledge is not a direct collaboration in it but refers to the creation of knowledge based on the knowledge (previously created knowledge) that has been shared. Therefore, knowledge management refers to a process that has a starting point and an evolutionary process. This process involves the following stages of gaining knowledge about hidden knowledge, revealing, sharing, reading and understanding and utilizing it in the creation of new knowledge. In this process, the initial stage, which focuses on identification and awareness of the hidden knowledge in the mind, reaches the stage of maturity that is understanding, using and recreating. This process, revealing the hidden knowledge, hiding the revealed knowledge and recreating knowledge is called the cycle of knowledge management by Nonaka and Takeuchi [1].

Defining knowledge management is not easy. Different authors from different perspectives and with different approaches have defined knowledge management. From Rabitz's point of view, knowledge management includes all the ways in which an organization manages its own knowledge assets, including how to collect, store, transfer, use, update, and create knowledge. Graver and Madhau also define knowledge management as the explicit and systematic management of crucial knowledge and processes for the creation, organization, dissemination, using and discovery of knowledge. Creating and re-creating of knowledge causes transformation, growth, and change. Therefore, knowledge management, which always deals with discovery and creation, is a process for transformation, development, and growth [4]. Perez believes that knowledge management is the accumulation of knowledge, rational capabilities, and experiences of individuals in an organization and the ability to retrieve them as an organizational asset. Newman believed that knowledge management is a set of events that involve the creation, dissemination, and application of subjective and objective knowledge in an organization [5].

Knowledge management is a process by which organizations will be able to turn data into information and information into knowledge, and will also be able to effectively utilize their knowledge in their decisions [6].

The process of knowledge management involves 4 stages. In the first stage, the existing knowledge in the organization and its sources (such as subjective and objective knowledge, information banks, and documents and ...) must be identified and then collected and saved in a proper way. Then for the knowledge to become valuable and lead to recreation, it must be shared amongst the people. Then the gained knowledge must be used in the direction of the organization's goals and in the last stage the knowledge is created using the new information in the system [7].
Denham Grey in a continuous debate in knowledge management assembly has discussed the main benefits of knowledge management in this manner [8-13]:

1. Preventing knowledge loss: predicts the knowledge needs of the organization and prevents knowledge loss.
2. Decision-making improvement: explaining this we must say that a human being can make the best decisions when he/she has enough knowledge about the subject.
3. Flexibility and adaption: the employees will get a better understanding of their jobs and propose innovative solutions.
4. Competitive advantage: makes the organization able to understand customers and the competitions better and identify competitive chances.
5. Increasing wisdom: the knowledge in the organization gains an intellectual property.
6. Increasing production: knowledge serves product development and increase.
7. Customer orientation: makes organizations able to attend to customer needs considering knowledge.
8. Using investment in the human resources section: via knowledge system in document processing organization and..., the organization can invest in recruiting and internship of the employees. The successful execution of knowledge management could lead to understanding market status and customer needs and optimize services and productions.

2.1. Petrochemical industry in Iran and the introduction of Shazand Petrochemical Company

In the petrochemical industry, which includes over 18 active complexes and about 15,000 official personnel, without any doubts, the main source is the knowledge that we have in the industry. The special conditions of the Iranian petrochemical industry, such as rapid progress, the transition from the state system to the private system and the entry into the world of competition, double the need to use new findings like knowledge management, and the Shazand Petrochemical Company is of no exception. Shazand Petrochemical Complex is one of the country's major infrastructure projects that are in line with the general policies of developing petrochemical industries with goals that are in line with the general policy of developing petrochemical industries with the goals of domestic supply and export needs.

The Shazand Petrochemical Complex projects plans were approved in 1363 and after the design, engineering and installation phases, the first phase was on the production line in 1372.

Since 1379, with the completion of units, the design and development of the complex were approved with the aim of increasing the capacity of the units, the first phase of which was completed in Mehr 1384 and the second phase operation was completed in the summer of 1386. The total capacity of the complex after the completion of the development plan is 1.469.000 tons per year.

3. Study methodology

The knowledge building basis model is used as the study model. This model is called knowledge management building basis model. The designers of this model have considered knowledge management as a dynamic cycle. It consists of 8 stages which are introduced in two inner and outer cycles [14]. Regarding this, the conceptual model of the study is stated in figure 1.

Considering that the results of this study could be used in Shazand Petrochemical Industry, this study’s goal is practical and considering being present in the organization and retrieving information from experts using survey, is a field study. By the way, the result of the study relates to the Shazand Petrochemical Industry, so it’s a case study.

This study aims to evaluate the status of knowledge management in Shazand Petrochemical Industry and the effective factor of its success.

In implementing knowledge management in Shazand Petrochemical Industry the reference method is the survey method. The statistical society involves superior, middle and executes managers working at the time of the study. The sample consists of 30 people chosen randomly and the volume of the sample is determined using Cochran formula.

To make sure the survey is justifiable, we’ve asked the experts of the industry for their opinion. In this study, the questioners completed the survey while visiting 20 of experts. This was done as the pre-test. After entering the results of the completed surveys in the pre-test section of the SHAZAM PETROCHEMICAL INDUSTRY software, the Cronbach's alpha was calculated and the result was 0.854. As you can see, considering the minimum needed coefficient for study surveys is 0.7, so the survey is justifiable.
Figure 1. Diagram of knowledge management

Figure 2. Knowledge management chart
3.1. Findings

To determine the level of each factor affects the AHP technique is used in this study and to increase the speed and precision of data analyzing, the Expert Choice software version 11 is used. After creating the decision tree in the software and entering the gathered data from surveys in the form of pair comparisons, while calculating incompatibility, it determines the weight of each factor (table 1). After this, the done prioritizing with the weight of each factor for the level of factors (the first level of study model and the level of sub-factors (the second level of the study) is presented.

Table 1. The weight of knowledge management elements regarding their effects on the quality of knowledge management (the weight of elements)

| The elements of the knowledge management | The weights of elements | The rate of incompatibility |
|-----------------------------------------|------------------------|----------------------------|
| The goals of knowledge                  | 0.313                  |                            |
| Knowledge identification                | 0.296                  |                            |
| Gaining knowledge                       | 0.112                  |                            |
| Knowledge development                   | 0.184                  | 0.01                       |
| Knowledge sharing                       | 0.095                  |                            |
| Using knowledge                         | 0.346                  |                            |
| Keeping knowledge                       | 0.176                  |                            |
| Knowledge assessment                    | 0.256                  |                            |

As you can see the most weight is of the factor of knowledge goals and the least weight belongs to the factor of knowledge sharing.

Table 2. The relative weights of the sub-elements of the factor of knowledge goals

| The sub-elements of the knowledge goals | The weight of elements | The rate of incompatibility |
|-----------------------------------------|------------------------|----------------------------|
| perspective                             | 0.216                  |                            |
| Making organizational knowledge a priority | 0.36116                | 0.05                       |
| Organizational weaknesses               | 0.096                  |                            |

Table 3. The relative weights of the sub-elements of the factor of knowledge identification

| The sub-elements of the knowledge identification | The weights of the elements | The rate of incompatibility |
|-------------------------------------------------|-----------------------------|----------------------------|
| Information banks inside the company            | 0.289                       |                            |
| Information banks outside the company           | 0.139                       | 0.02                       |
| The knowledge of colleagues                     | 0.275                       |                            |
| The knowledge of users outside the company      | 0.256                       |                            |

Table 4. The relative weights of the sub-elements of the factor of gaining knowledge

| The sub-elements of the gaining knowledge        | The weights of the elements | The rate of incompatibility |
|-------------------------------------------------|-----------------------------|----------------------------|
| Using inside and outside counselors             | 0.141                       |                            |
| Common research projects                        | 0.378                       |                            |
| Holding national conferences                    | 0.276                       | 0.04                       |
| Holding international conferences               | 0.089                       |                            |
| Holding special educational courses             | 0.456                       |                            |
| Access to national and international websites   | 0.285                       |                            |
Table 5. The relative weights of the sub-elements of the factor of knowledge development

| The sub-elements of knowledge development | The weight of the elements | The rate of incompatibility |
|------------------------------------------|---------------------------|----------------------------|
| Updating organizations knowledge         | 0.354                     |                            |
| Changing the goals based on the gained knowledge | 0.257                   | 0.06                       |
| Recruiting knowledgeable individuals     | 0.375                     |                            |

Table 6. The relative weights of the sub-elements of the factor of knowledge sharing

| The sub-elements of the knowledge sharing | The weights of the elements | The rate of incompatibility |
|------------------------------------------|-----------------------------|----------------------------|
| Managers activities in holding scientific meetings | 0.112 |                     |
| Creating forums                          | 0.091                       | 0.04                       |
| Job cycling                              | 0.099                       |                            |
| Teamwork                                 | 0.258                       |                            |

Table 7. The relative weights of the sub-elements of the factor of using knowledge

| The sub-elements of the using knowledge | The weights of the elements | The rate of incompatibility |
|-----------------------------------------|-----------------------------|----------------------------|
| Using colleagues knowledge              | 0.346                       |                            |
| Implementing managers knowledge         | 0.183                       | 0.04                       |
| Checking previous project documents     | 0.258                       |                            |
| Risk taking in experimenting            | 0.094                       |                            |

Table 8. The relative weights of the sub-elements of the factor of keeping knowledge

| The sub-elements of the keeping knowledge | The weights of the elements | The rate of incompatibility |
|------------------------------------------|-----------------------------|----------------------------|
| Saving the methods of doing jobs         | 0.135                       |                            |
| Creating knowledge banks                 | 0.286                       | 0.05                       |
| Keeping knowledge bases updated          | 0.194                       |                            |
| Access of the employees to each other’s scientific experiences | 0.084 |                     |

Table 9. The relative weights of the sub-elements of the factor of knowledge assessment

| The sub-elements of the knowledge assessment | The weights of the elements | The rate of incompatibility |
|---------------------------------------------|-----------------------------|----------------------------|
| Managers educational performance assessment | 0.175                       |                            |
| Managers research performance assessment    | 0.082                       |                            |
| Using the critics and suggestions system    | 0.264                       | 0.04                       |
| Preferring knowledge quality to its quantity | 0.364                       |                            |
| Giving feedback on the results of knowledge performance | 0.352 |                     |

The rate of incompatibility in all of the made decisions is less than its legal limit which is 10%. Therefore, regarding the tables 2-9:

- Regarding the Ashland Petrochemical Industry of knowledge goals, the most weight is of the sub-element of making organizational knowledge management a priority in the organization’s strategy and the least weight belongs to the sub-element of the level of company’s awareness of its knowledge weaknesses.
- Regarding the Ashland Petrochemical Industry of knowledge identification, the most weight is of the sub-element of creating information banks inside the company and the least weight belongs to the sub-element of identifying information banks and documents outside the company.
• Regarding the Ashland Petrochemical Industry of knowledge gaining, the most weight is of the sub-element of holding special educational courses and the least weight belongs to the sub-element of holding international conferences.

• Regarding the Ashland Petrochemical Industry of knowledge development, the most weight is of the sub-element of recruiting knowledgeable individuals and the least weight belongs to the sub-element of changing goals based on the gained knowledge.

• Regarding the Ashland Petrochemical Industry of sharing knowledge, the most weight is of the sub-element of teamwork and the least weight belongs to the sub-element of creating virtual forums.

• Regarding the Ashland Petrochemical Industry of using knowledge, the most weight is of the sub-element of using colleague’s knowledge and the least weight belongs to the sub-element of risk-taking in executing innovative projects.

• Regarding the Ashland Petrochemical Industry of keeping knowledge, the most weight is of the sub-element of keeping knowledge bases updated and the least weight belongs to the sub-element of access of employees to each other’s scientific experiences.

• Regarding the Ashland Petrochemical Industry of knowledge assessment, the most weight is of the sub-element of preferring knowledge quality to its quantity and the least weight belongs to the manager’s research performance assessment.

The final weight of each of the sub-factor equals the relative weight of sub-factor multiplied by the relative weight of the factor.

| The element                      | The sub-factors                                      | The relative weight of the sub-factor | The relative weight of the factor | The final weight |
|---------------------------------|------------------------------------------------------|--------------------------------------|----------------------------------|-----------------|
| Knowledge goals                 | perspective                                          | 0.216                                | 0.313                            | 0.036           |
|                                 | Making organizational knowledge a priority           | 0.36116                              | 0.313                            | 0.114           |
|                                 | Organizational weaknesses                            | 0.096                                | 0.313                            | 0.030           |
| Knowledge identification        | Information banks inside the company                | 0.289                                | 0.296                            | 0.085           |
|                                 | Information banks outside the company               | 0.139                                | 0.296                            | 0.041           |
|                                 | The knowledge of colleagues                         | 0.275                                | 0.296                            | 0.081           |
|                                 | The knowledge of users outside the company          | 0.256                                | 0.296                            | 0.075           |
| Gaining knowledge               | Using inside and outside counselors                 | 0.141                                | 0.112                            | 0.015           |
|                                 | Common research projects                             | 0.378                                | 0.112                            | 0.042           |
|                                 | Holding national conferences                        | 0.276                                | 0.112                            | 0.030           |
|                                 | Holding international conferences                   | 0.089                                | 0.112                            | 0.009           |
|                                 | Holding special educational courses                 | 0.456                                | 0.112                            | 0.051           |
|                                 | Access to national and international websites       | 0.285                                | 0.112                            | 0.031           |
| Knowledge development           | Updating organizations knowledge                    | 0.354                                | 0.184                            | 0.065           |
|                                 | Changing the goals based on the gained knowledge    | 0.257                                | 0.184                            | 0.047           |
|                                 | Recruiting knowledgeable individuals                | 0.375                                | 0.184                            | 0.069           |
| Knowledge sharing               | Managers activities in holding scientific meetings   | 0.112                                | 0.095                            | 0.010           |
|                                 | Creating forums                                     | 0.091                                | 0.095                            | 0.008           |
|                                 | Job cycling                                         | 0.099                                | 0.095                            | 0.009           |
|                                 | Team work                                           | 0.258                                | 0.095                            | 0.024           |
| Using knowledge                 | Using colleagues knowledge                          | 0.346                                | 0.346                            | 0.119           |
|                                 | Implementing managers knowledge                     | 0.183                                | 0.346                            | 0.063           |
|                                 | Checking previous project documents                  | 0.258                                | 0.346                            | 0.089           |
|                                 | Risk taking in experimenting                        | 0.094                                | 0.346                            | 0.032           |
| Keeping knowledge               | Saving the methods of doing jobs                   | 0.135                                | 0.176                            | 0.023           |
|                                 | Creating knowledge banks                            | 0.286                                | 0.176                            | 0.050           |
|                                 | Keeping knowledge bases updated                     | 0.194                                | 0.176                            | 0.034           |
|                                 | Access of the employees to each other’s scientific experiences | 0.084 | 0.176 | 0.014 |
| Knowledge assessment            | Managers educational performance assessment          | 0.175                                | 0.256                            | 0.044           |
|                                 | Managers research performance assessment            | 0.082                                | 0.256                            | 0.020           |
|                                 | Using the critics and suggestions system            | 0.264                                | 0.256                            | 0.067           |
The software has calculated the rate of incompatibility 3% and this show decision makings optimal compatibility.

Regarding the gathered data by the surveys and concluding them the level of knowledge management success in Shazand Petrochemical Industry and comparing it to the optimal level is shown in table 11 and figure 3. Consider that according to the level of the organizational maturity and the experts, the optimal level for the Shazand Petrochemical Industry is 75%.

The sub-factors

The relative weight of the factor

The final weight

| The element | The sub-factors | The relative weight of the sub-factor | The relative weight of the factor | The final weight |
|-------------|-----------------|--------------------------------------|----------------------------------|-----------------|
| Preferring knowledge quality to its quantity | 0.364 | 0.256 | 0.093 |
| Giving feedback on the results of knowledge performance | 0.352 | 0.256 | 0.090 |

Table 11. The comparison of the current level with the optimal level of each of the Ashland Petrochemical Industries of knowledge management

| aspects                        | Average (percent) | The gap (percent) |
|-------------------------------|-------------------|-------------------|
| Knowledge goals               | 41.44             | 33.56             |
| Knowledge identification      | 40.42             | 34.58             |
| Gaining knowledge             | 39.73             | 35.27             |
| Knowledge development         | 38.78             | 36.22             |
| Knowledge sharing             | 35.67             | 39.33             |
| Using knowledge               | 35.33             | 39.67             |
| Keeping knowledge             | 38.42             | 36.58             |
| Knowledge assessment          | 33.78             | 41.22             |
| Conclusion                    | 38.37             | 36.63             |

Figure 3. The comparison of the current level with the optimal level of each of the Ashland Petrochemical Industries of knowledge management
4. Conclusions

It takes effort and resources to attend to all of the knowledge management aspects. Therefore, companies want to achieve a more optimal result by not changing lots of things. According to the various limitations such as time and other resources. The factors with higher priorities must be attended before the other factors. Therefore, the scale of this study are the factors with the weight above 0.06 so according to the 10, we summarize the study to the 9 factors which have the most priority in successfully managing knowledge. What said here can be applied to all of the petrochemical companies and it's possible that some of them have already done some efforts in these fields and have left other competitors behind. So we can consider the said priorities as a checklist for assessing the status of knowledge management in petrochemical industries.

It's recommended to do some research about other effective factors in knowledge management in petrochemical industries and how to invest in this field. If it's possible, make connections with the successful organization in the field of knowledge management and prepare the background of employees effective partaking. Imitating the organizations which have implemented knowledge management successfully in their organization could help municipalities to make quick progress toward this crucial subject. In the end, we must point out that for effectively implementing knowledge management at first we must choose the knowledge management strategy considering the hidden and obvious knowledge in the petrochemical industry and then specify the industry’s main direction to invest in knowledge management.

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