

# Developing a Model of Knowledge Networks in Organizations — Case Study: Petroleum Industry of I.R.Iran

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**Abstract**—This research is done with the purpose of examining the necessities in managing knowledge and knowledge network creation in the petroleum industry of Iran.

This research on the base of its goal is a developing research, and the research methodology is quantitative and survey research. Needed information in this study is gathered from document analysis and semi-directed interview and analyzed by content analysis method consequently.

The results of this research reveal that because of special properties which exist in large industries like petroleum industry (including geographical expansion area, wide variety of technical knowledge fields, many specialists and experts, etc.), knowledge management is so important that knowledge networks are the most efficient and effectiveness way for managing knowledge. These knowledge networks are designed in order to cause innovation and create and share knowledge amongst individuals and different knowledge bases. Also different kinds of knowledge and their application in the industry especially in petroleum industry, different ideas about a framework for knowledge network and finally designing a basic model for developing knowledge networks in organizations will be presented.

**Index Terms**—Knowledge, network, knowledge networks, knowledge management, petroleum industry.

## I. INTRODUCTION

In order to reach the goals and do the duties, organizations own different sources and assets. Some of these sources are valuable and strategic which play a main role to acquire organizational competitive preference. Knowledge is one of these sources and assets for all organizations, so that experts consider knowledge as final alternative for production, wealth, and monetary capital. [1] In fact, knowledge is an unique source in the organization that during usage time not only its value does not decrease, but also it increases.[2] This knowledge does exist in organizational procedures, instructions, viewpoints, actions and decisions. It does mind more when it transforms to valuable products and services. Therefore, it can be concluded that organizations permanent competitive preference comprises of the things they know and with what speed they can use their knowledge. [3]

Knowledge management means to take control and

authority of the knowledge of human capital of organization and even the knowledge in exterior part of organization, propagating it to do existing assignments in the organization which would be more improved and developed. The goal of knowledge management is to identify, collect, classify and organize, store, publish, disseminate and make available the knowledge in organization. In organizations which are managed in traditional forms, the knowledge flows from up to down through organizational lines. Thus, the knowledge is seldom available at the right time and where it is needed more. But, in the knowledge-oriented organization in which consider implementing knowledge management, the knowledge is flowing throughout the organization. Everyone according to their own needs can use it to do their assignments at the right time.

## II. THE NECESSITY OF MANAGING KNOWLEDGE IN PETROLEUM INDUSTRY OF IRAN

In petroleum industry of Iran; by taking advantage of knowledge, proficiency, and experience; a wide range of specialists in different fields such as oil, gas, petrochemical, purification and distribution of oil production, drilling, business management, IT, etc. and in different parts of exploration, extraction, transportation and production are working on different projects with different subjects. In petroleum industry (particularly because of expansion of activities) a big volume of knowledge is produced by implementing and performing different projects.

Some parts of this knowledge are recorded in forms of evidences, reports, software, instructions, etc.(explicit knowledge) and some parts are intangible (tacit knowledge) which remains concealed in people's minds as experiences, relations, skills, insights, etc. These parts own a little possibility for transferring and being used again. Lack of allotment and re-using of produced knowledge in the existing activities and knowledge capitals in petroleum industry (including humanity capital, structural capital, and communication capital) is actually wasting the expenses and it indicates that there is no productivity. On the other hand, since an important part of current knowledge in petroleum industry is intangible and it is hidden in people's minds as intellectual capital, in practice by exiting of those people from this industry (because of retirement, transferring, adjusting) this knowledge will exit the industry too.

From a decade ago, the petroleum and gas industries around the world have used knowledge management improvements and now it is taken into consideration by different petroleum companies as a scientific subject with

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various organizational, technological, and humanity approaches. When petroleum companies focus on new technologies, using of external resources, taking new partners, evaluating management, governmental regulations, managing capacities, reducing costs and environmental issues, knowledge management groups can help them in forecasting, planning, processing, and lots of technological innovations through using the technology and knowledge transferring.

The definition of Chevron company; as one of the biggest petroleum companies in the world; about knowledge management is applied in majority parts of industry, it is defined as: processes, tools, and behaviors which give correct concept to correct individuals at the correct time and in the correct situations. So they can make the best decisions, take advantage of existing opportunities, and propagate innovative ideas. Also the world gas and petroleum leaders focus on knowledge management:

“We have learned we can use knowledge to achieve improvements in our company. We focus on purchasing knowledge from external parties, bringing it into the organization rather than attempting to create something by our own. Every day that a new idea comes and we cannot use it, actually we have lost an opportunity. We should participate into knowledge promptly”, Ken Derr, manager of Chevron Company says.

“Using a knowledge which is more efficient than competitors is an issue that all companies encounter with it”, John Brown, BP Company says.

“Knowledge management is a framework for innovation. It brings business success in compatibility of employees with quickly changing operational environment”, Brendan O’Neill from Imperial Chemicals Industries said[4].

### III. KNOWLEDGE NETWORKS CREATION

Networked organizations have been defined as the product of the evolution of organizational structures, facilitated by technologies that transcend time and space[5], and as business networks that interact at the global level.[6] At the micro-level, the term network designates a social relationship between actors according to content (products or services, information), form (duration and closeness of the relationship) and intensity (communication frequency).

Knowledge networks are one of the knowledge management ways. Its creation rationality is to create synergistic effects by effective combination of knowledge bases of associated companies. As a result, it is expected that knowledge bases of related companies will be developed, because companies interchange the best ways simultaneously, and create capabilities based on new knowledge. So, it will facilitate routine works in working environment. [7] Most of people believe in that the main reason for existence of multinational corporations is the ability of transferring and using knowledge effectively in intra-corporate environment. Some current prominent multinational corporations reach to knowledge network ways, because, competitive preference resources are often found, out of their companies and in communication networks, where the company is established there.

In the knowledge network of organization, different tools are considered for knowledge flowing. These tools are as follow:

- Data mining and neural networks which new relations, patterns, and models in data are discovered by them.
- Search engines which facilitate searching of knowledge and new knowledge creation by structuring information using spider like pattern.
- Knowledge centers and organizational portals which help employees in storing and retrieving the knowledge.
- Electronic discussion forums, classifying knowledge and other social network services which prepare the possibility of efficient and effectiveness sharing and transferring of knowledge.
- Work flow control system and concept analysis support application of knowledge in business.

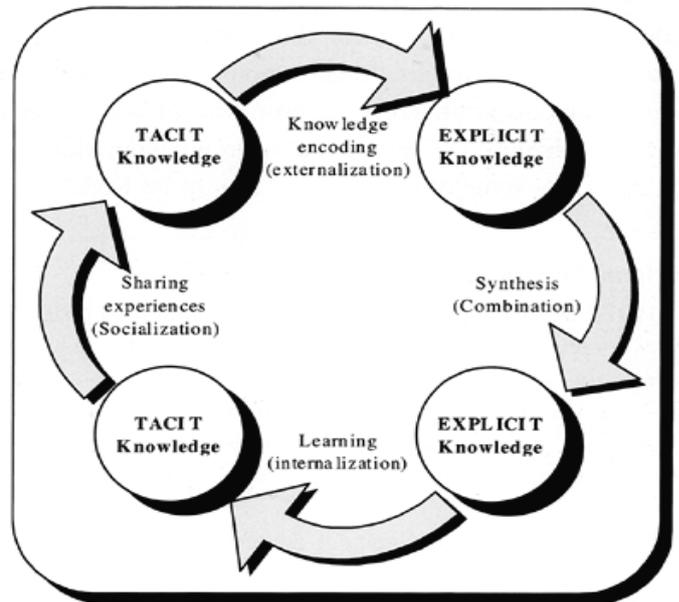


Fig. 1. SECI model of cyclical knowledge creation.

Establishing the model of SECI [8] in an organization will still be operational by knowledge network. For example, portals and content management tools support transformation of explicit knowledge to explicit knowledge, electronic learning and knowledge decoding support transformation of explicit knowledge to tacit knowledge, communication and mutual cooperation technologies support transformation of tacit knowledge to explicit knowledge, and individual by individual relation networks support tacit knowledge to tacit knowledge. Knowledge networks have different kinds. Glover considers knowledge networks as a combination of three networks:

1) Collaborative innovation networks: members of this kind of network are homologous and self-motivated persons who have a common outlook. They meet each other in purpose of mutual communication of ideas, knowledge, experiences, and working in cyber environment (e.g. Linux Kernel developers).

2) Collaborative learning networks: These networks are formed by people who are interested in sharing knowledge and experience to gain mutual profit from individual experiences and from group knowledge of other members that

all of them have a similar opinion.(like Xerox device repairers)

3) Collaborative interest networks: members of this kind of network have common interests, but group working would not be performed through network. Minority of members are usually active and online. They share their knowledge and experience in virtual community. Majority of people are offline and just collect information. This kind of network is mostly seen in the Internet. (Like Internet users and people who are interested in blogs).

As knowledge increasingly becomes a key organizational resource, the creation and sharing of knowledge among organizational members has become of interest to organizational researchers. While explicit knowledge is shared throughout the organization, tacit forms of knowledge remain embedded in the individual but can be shared among individuals and groups in the right circumstances, for example, through networking. In order to further understand the complexities of knowledge creation and sharing it is important to focus on different groups and not to treat all workers as homogenous. Linking networks and knowledge creation in this way will reveal differences amongst different groups of workers[9].

#### IV. A FRAMEWORK FOR KNOWLEDGE NETWORKS

High performing knowledge workers have been found to leverage their informational environments through networks because they find and use information through using their own knowledge and expertise but also through their social networks by seeking out information from colleagues and friends. [10]

The framework of knowledge networks comprises of the following components: actors, individuals, groups, organizations; relationships between actors, which can be categorized by form, content and intensity; resources which may be used by actors within their relationships, and institutional properties, including structural and cultural dimensions such as control mechanisms, standard operating-procedures, norms and rules, communication patterns and so on.

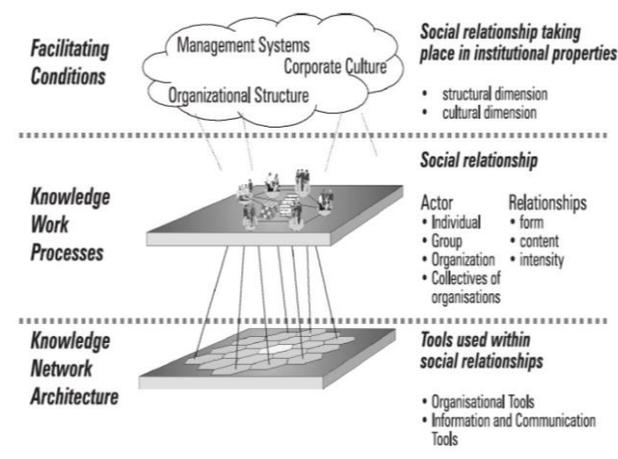


Fig. 2. Framework of knowledge networks - a micro perspective

These components can be perceived from either a static or a

dynamic point of view. From a micro perspective, we conceptualize knowledge networks on the following three building-blocks. [11]

#### V. DEVELOPING A MODEL OF KNOWLEDGE NETWORKS

Briefly reviewing the literature of article, it is founded out that in order to design the development model of knowledge networks, some variables relate to structural properties of these networks (knowledge network necessities, knowledge network levels, and knowledge trees) and other variables relate to content features (knowledge species and intellectual capital of organization). Each one of these variables includes some components as follows:

Knowledge network: the main applications of knowledge network in the organization are: knowledge acquisition, knowledge sharing, accessing to internal and external knowledge.

Knowledge network necessities: a knowledge network needs to be supported by technology infrastructures (like the Internet and Intranet), communication and architectural networks.[12]

Networks levels of organization: networks which exist in the organization are divided into levels as follows: organizational network, national network, international network, multinational network, and global network. [13]

Knowledge tree: knowledge fields in organizations can be classified in tree structure. Generally, knowledge fields in all organizations are divided into two knowledge groups: general knowledge (i.e. common between all organizations, like management knowledge), and technical knowledge (relates to special activity of each organization).

Knowledge species: through a brief review of scientific resources, generally, there are two different typologies for knowledge of organization. Edwards and Mahling believe that different kinds of knowledge are as follows: administrative knowledge, declarative knowledge, procedural knowledge, analytical knowledge. [14] But some other experts believe that knowledge of organization comprises of two kinds of explicit and tacit knowledge.[8]

This group of experts believes in that explicit knowledge can be encrypted and coded, so it can be easily transmitted, processed, transferred, and stored in data bases. We can shape this kind of knowledge and publish it between people in the organization in form of a scientific formula or a guidance book.

Instructions, laws and regulations, procedures, standards, details description and so on, which are formal between people in organizations and can be simply transferred, are all explicit knowledge. But tacit knowledge is subjective and personal. It is difficult to formulate it. This kind of knowledge which is often acquired through sharing experiences and observations and also emulating, are deriving from people's actions, procedures, values and feelings. Also tacit knowledge could not be easily coded and transmitted through a similar language.

According to former studies in the petroleum industry and researchers' recognition about this industry, the second typology is applied more in petroleum industry. So it is used

for drawing the basic suggested model of researcher in macro theoretical framework of the research.

Intellectual Capital: It includes that part of whole capital and asset of company that is based on knowledge and the company owns it. Intellectual capital comprises of three main parts such as below: human capital, structural (organizational) capital and communicative (customer) capital. Knowledge networks pattern in petroleum industry has some functions that the most important ones are:

- 1) Helping in policy making and determining the policy of oil ministry.
- 2) Classifying the knowledge according to materiality, function, degree of confidentiality and so on.
- 3) Operational and administrative policies.

According to presented definitions, the basic suggested model for developing knowledge networks in organizations is as follows:

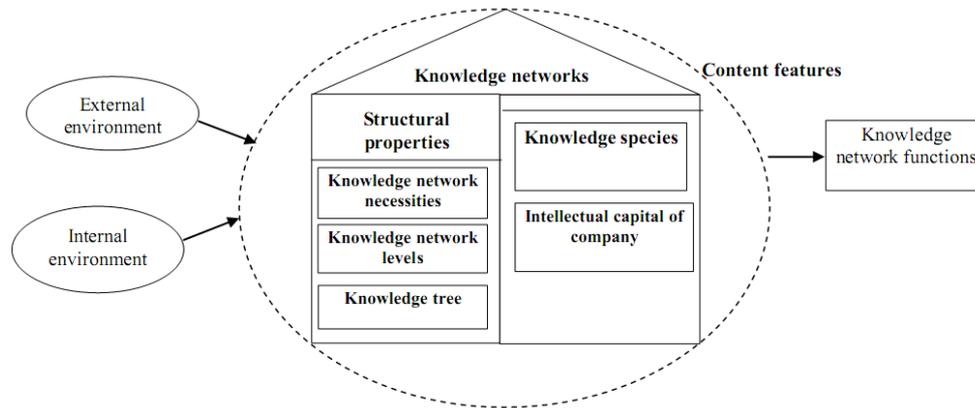


Fig. 3. A basic model of knowledge networks in organizations.

According to capabilities that are created by knowledge networks for organizations, they are appropriate solutions for innovation, knowledge creation, sharing individual and organizational knowledge in petroleum industry (and other industries). Knowledge networks are the most efficient and effectiveness way to manage the knowledge. They are designed to share knowledge amongst different individuals and knowledge bases. Based on researches, the second typology is applied more in petroleum industry. It is used for drawing the basic model for developing knowledge networks in organizations. By designing of this model, knowledge networks will demonstrate the main applications and the most important functions of an efficient and effectiveness knowledge network.

## VI. CONCLUSION

Managing knowledge networks within organizations has taken on enhanced importance in recent years because of the decline of middle management and other changes in formal organizational structures, the growth of information technologies, and our increasingly competitive global economy.[7]

Knowledge networks can be manifested in a variety of forms: project teams, research groups, advice networks, professional communities, communities of practice, support groups, and so on. Individuals increasingly find that they must determine for themselves what choices they will make, distilling the information they have gathered in their personal networks to knowledge that results in strategies they can pursue as they act in an ever more complex world. The awareness of the operation of knowledge networks is, quite literally, an important survival tool for individuals. In turn, resulting individual learning and actions determine how

organizations adapt themselves to the rapidly changing environments and how they innovate to meet new challenges.

As it was mentioned in this article, because of special properties that exist in Iran petroleum industry, knowledge management is very important. However official structures of petroleum industry, which are shown in structural diagrams, do not show the real flow of knowledge in industry and informal networks play a main role in doing activities and transferring knowledge.

During recent years, informal networks have taken the most attention of senior managers. Organizations have found that most activities are done cooperatively and through these informal networks.

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