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Full Length Research Paper

Evaluating factors that cause problem in implementation of knowledge management in Iran's oil and gas industry

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Knowledge management is a process that develops, stores, and disseminates information in an organization to have better business performance and gain competitive advantage. Nowadays organizations realized the importance of managing knowledge within organization as a necessity to survive in today's competitive market. There are several barriers for implementation of knowledge management due to culture and infrastructures. Iran as a developing country faces even more challenges implementing knowledge management in industries. Oil and gas as a leading industry usually pioneers in applying new management concepts in Iran. This research is going to discover and test main knowledge management implementation elements and find lacks in Iran's oil and gas industry.

Key words: Knowledge management implementation, Iran oil and gas industry, critical success factors (CSF).

INTRODUCTION

Data, information and knowledge

Knowledge production is the most important value creating activity, not just for huge knowledge-based companies, but also for the society in general (Drucker, 1993; Stehr, 1994). Today, knowledge is called the key asset, the effective utilization, which determines success for the organization and knowledge management is the value generating process in organizations which generates value from their intellectual and knowledge-based assets (Levinson, 2003). First step to know about knowledge management is to know the distinction between different concepts of knowledge. There is an important difference between data, information, knowledge and wisdom (Alavi and Leidner, 1999). Data is defined as a flow of events or activities captured by an organization's system that, by itself, is useful for transacting but not more than that. Data also has various definitions, mostly depending on the context of its use. For example, information science defined data as unprocessed information and other domains leave data as a representation of objective facts (Dunford, 2000).

We can store data in databases or fill a store. Data can be mined for useful information or we can extract data. We can look at the data or experience the uniformity of data entry (Hansen et al., 1999).

To convert data to useful information, an organization must use its resources to organize data to categories which are understandable. For converting information into knowledge organization has to use more resources to find out patterns, rules and contexts where the knowledge works (Nickols, 2008).

Eventually, wisdom can be the applying of knowledge to solve the problems. In fact, wisdom is thought to be the answer to where, when and how to implement knowledge.

Figures 1 and 2 (Hey, 2004) demonstrate two aspects of the DIKW hierarchy. Figure 1 depicts it as a linear chain and Figure 2 shows it as the 'knowledge pyramid'.

Tacit versus explicit knowledge

Knowledge may be explicit or tacit (Nonaka and Takeuchi, 1995). Explicit knowledge is a form of knowledge that has been codified in a formal manner.

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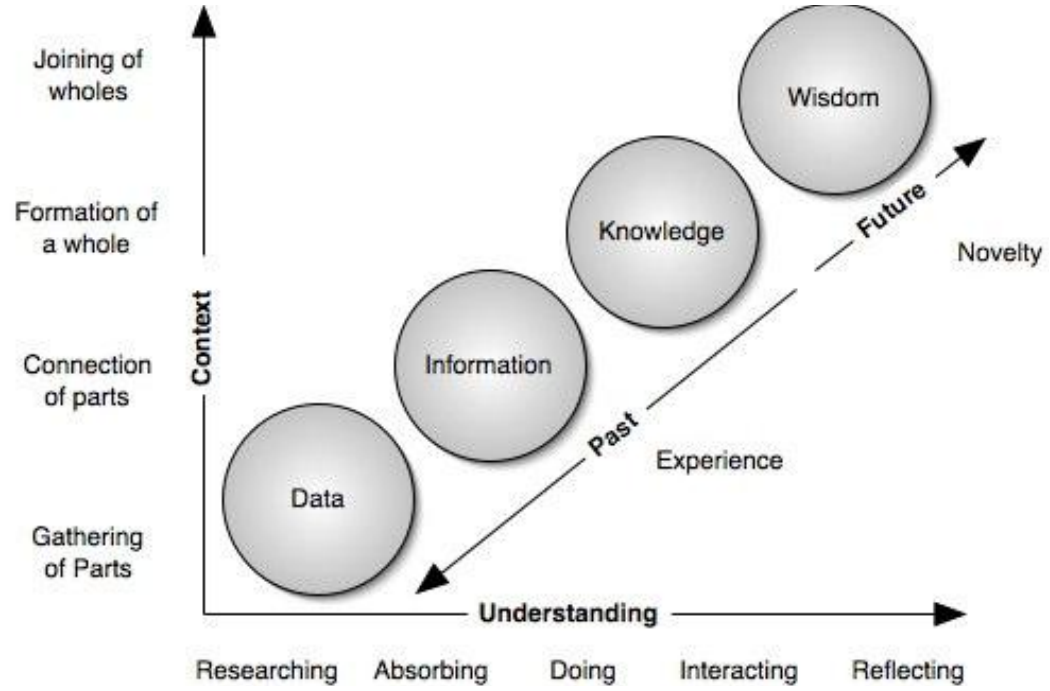

Figure 1. DIKW linear chain (Hey, 2004).

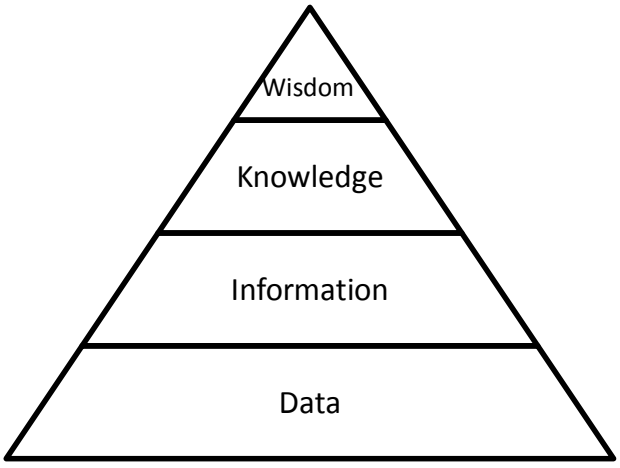

Figure 2. The knowledge pyramid.

Therefore, it is suitable for intercommunication in various forms including through on-line databases. That kind of knowledge which is not explicit is tacit knowledge; it is an understandable form of knowledge and may not have been presented in verbal form.

Tacit knowledge

Tacit knowledge is that kind of knowledge that cannot be documented, but can only be transferred through training or gained from personal experience (Alwis and Hartmann, 2008). Alternatively, tacit knowledge can be called a knowledge that is embedded in a culture (for example a regional culture, organizational culture or social culture) and is difficult to share with people out of that culture.

As Polanyi (1997), the chemist-philosopher who coined the term, put it, “we know more than we can tell”. Polanyi used the example of being able to distinguish a person’s face but being only vaguely able to describe how that happened. This is an example of recognizing a pattern. Recognizing the reaction on the face of a customer or typing text in a high speed using a word processor offer other examples of situations that we are able to perform well but unable to articulate what we know or how we put it into practice exactly.

Explicit knowledge

Explicit knowledge is knowledge that can be articulated, codified, and stored in specified media. And, it can be transmitted to other people. In a famous 1991 Harvard Business Review article titled “the knowledge creating company”, Ikujiro Nonaka calls explicit knowledge as “formal and systematic”. Ikujiro Nonaka gave some examples such as product specifications, scientific formulas and computer programs (Gupta et al., 2000). One example of explicit knowledge which we are all familiar with is the formula of the area of a rectangle (for example length times width). Other examples of explicit

knowledge include documented best practices, formalized standards that an insurance claim is commanded and the official expectations for performance which set in written work objectives. Most used kind of explicit knowledge is manual, document and procedure.

Knowledge management implementation critical success factors

Critical success factors (CSFs) can be defined as “areas in which results, if they are satisfactory, will ensure successful competitive performance for the organization” (Rockart, 1979). As lack of any factor that cause success can be a failure factor, studying critical success factors can help the organization to find out problems in front. Reaching to the factors which are critical for a successful Knowledge management (KM) implementation is the main challenge in front of organization in the KM application procedure (Chandran and Raman, 2009).

A broad range of factors influencing KM implementation success has been mentioned in the literature. For instance, much has been stated about culture, information technology (IT) and leadership as important considerations for its accomplishment.

Based on the insights gleaned from the study of practices and experiences of leading companies in the KM field, Skyrme and Amidon (1997) highlighted seven critical success factors. These include a strong link to a business directorial, a compelling vision and architecture, knowledge leadership, a knowledge creating and sharing culture, continuous learning, a well-developed technology infrastructure and systematic organizational knowledge processes. It was stated that not all of these factors would be important for small scale pilot projects. However, they would certainly need to be considered for those organizations that were formalizing KM or transforming themselves into true knowledge-based enterprises. A study to investigate the factors which can influence the management of knowledge in organizations has been done by Holsapple and Joshi (2000). First, they derived a set of factors from various literature sources. Then, they did a Delphi study, comprising an international panel of KM academics and practitioners to further explore and evaluate the factors that they had developed earlier. They suggest three basic classes of influences managerial, resource and environmental), with different factors in any of them. Managerial influences include four managerial factors, coordination, control, measurement and leadership; resource influences consisted of knowledge, human, material and financial resources; when environmental influences comprised factors such as competition, markets, time pressure, governmental and economic climates, etc.

Davenport and Volpel (1998) conducted an exploratory study on 31 KM projects in 24 organizations; one of the goals was to determine the factors associated with their effectiveness. Before doing so, they evaluated the performance of the projects using indicators analogous to those for assessing the success of other business change initiatives. As a result, 18 projects were classified as successful, from which eight common success factors were identified. They were linking knowledge management to economic performance or value of industry, a clear purpose and language, a standard and flexible knowledge structure, multiple channels for knowledge transfer, a knowledge-friendly culture, a technical and organizational infrastructure, change in motivational practices and senior management support.

According to Hasanali (2002), the success of a KM effort depends on many factors. Hasanali (2002) highlighted five categories of factors: Leadership, structure, culture, IT infrastructures, roles and responsibilities and measurement. Likewise, the APQC (1999) included strategy and leadership, culture, technology and measurement in their framework as enablers which can support the operation of KM. Although, these factors are eminently sensible, it is believed that the success of KM is dependent on more aspects.

Based on the review of literature about critical success factors of KM, three major factors can be mined. Culture, information technology and KM strategy are three basic factors of KM implementation. As culture is a broad concept it can be divided into two categories including management and organizational culture which are both very critical in KM implementation. These four critical success factors and their resources showed in Table 1.

Questions in front of organization

Nowadays lots of organizations aim to have knowledge management inside. Having tacit knowledge codified organizations can use explicit knowledge any time they wish and keep intellectual asset inside company (Arifin, 2007). Applying knowledge management can bring competitive advantage for organizations in long term. But before implementing knowledge management, any has to find out the answer of some questions. They have to ask whether are the culture, actions and beliefs of managers in favor of value, purpose and role of knowledge management or not. Also they have to check their information technology (IT) ability and be aware about the role of IT in knowledge management. They must ask themselves how they want to organize for KM, and are knowledge systems in the firm mature enough to apply KM. Organizational culture is a critical and important aspect for facilitate sharing, learning and creation of knowledge. Culture in terms of managers is another important issue which should not be neglected. Also IT is a fundamental infrastructure.

Without having a proper IT infrastructure implementing KM seems to be impossible.

Table 1. List of KM success factors.

CSF	Researchers
Management culture	Skyrme and Amidon (1997), Holsapple and Joshi (2000), Davenport et al. (2001); Liebowitz (1999); Hassanali (2002); American Productivity and Quality Center (APQC) (1999); Ribiere and Sitar (2003); Wong and Aspinwall (2005); Al-Busaidi and Olfman (2005); Chong (2006); Akhavan and Jafari (2006); Akhavan et al. (2006); Jafari et al. (2007); du Plessis (2007).
Organizational culture	Skyrme and Amidon (1997), Davenport and Volpel. (1998), Liebowitz (1999), (APQC) (1999), McDermott and O'Dell (2001), Hassanali (2002); Wong and Aspinwall (2005); Al-Busaidi and Olfman (2005); Hung et al. (2006); Akhavan et al. (2006); Chong (2006); Bozbura (2007); du Plessis (2007).
Information technology	Skyrme and Amidon (1997) ; Davenport and Volpel. (1998); (APQC) (1999); Alavi and Leidner (1999); All-Buaidi and Olfman (2005); Hung et al. (2006); Wong and Aspinwall (2005); Akhavan et al. (2006); Akhavan and Jafari (2006); Chong (2006); du Plessis (2007).
KM strategy	Skyrme and Amidon (1997) ; Davenport and Volpel (1998); Liebowitz (1999); (APQC) (1999); Zack (1999); Wong and Aspinwall (2005); Akhavan et al. (2006); Bozbura (2007); du Plessis (2007)

National Iranian Oil Company (NIOC)

The National Iranian Oil Company (NIOC) is a government-owned corporation under the direction of the Ministry of Petroleum of Iran. It is oil and natural gas producer and distributor with headquarter in Tehran. NIOC was established in 1948. NIOC is the second largest oil company in the world, after Saudi Arabia's state-owned Aramco.

The NIOC is the exclusive responsible of the exploration, extraction, transportation and exportation of crude oil. It is also responsible for sales of natural gas and liquefied natural gas (LNG). NIOC provides the domestic refineries and manufacturing plants with crude oil required for the petroleum products and also exports its surplus production according to commercial considerations in the framework of the quotas determined by the organization of petroleum exporting countries (OPEC) and at the prices current in the international markets.

The NIOC also signs some long-term contracts on the base of "buy-back" with foreign companies in order to exploit national oil fields and export its products. The NIOC exports natural gas and liquefied natural gas through one of its subsidiaries, the "National Iranian Gas Export Company".

Knowledge management implementation problems in NIOC

Having seen challenges for implementing knowledge management, it is more understandable that Iran's oil and gas industry have much to be prepared for KM. First problem is about managerial culture. Although, top managers have a good sight about new concepts of management in the organization, still their knowledge about KM is very superficial. Even after applying KM usage of probable results is seriously questioned. In middle management step, also lack of specialized knowledge-oriented managers is obvious. However, there are lots of educated managers who are capable of handling KM implementation process, but their duty is different and a huge change in organization chart is needed. Iranian oil and gas industry companies have the most advanced IT infrastructure, but still this structure is insufficient and irrelevant for applying KM. Putting most of effort on production there is a huge gap of flow of knowledge inside NIOC. In other words, knowledge systems inside the company are not mature enough to benefit from knowledge based projects. So, it seems to be very useful finding out problems and planning to solve using a prioritized schedule.

Research problem

Knowledge management is a growing concept in today's managerial world and all industries intend to apply knowledge management in order to gain competitive advantage. To keep competition with regional and global competitors Iran's oil and gas industry want to follow all new managerial techniques. Thus knowledge management as an emerging concept which has a main role in today's competitive business is an appealing issue for Iranian oil and gas industry managers. But applying knowledge management will make managers to face lots of challenges including cultural and infrastructural issues. As importation of knowledge management I s inevitable,

the question is what are the problems and challenges in front of this entrance. Is organizational culture in Iranian oil and gas companies ready to accept KM? In other words is it possible for organization to convince employees to behave in favor of knowledge management goals? Another question about culture relates to managers themselves whether they understand the necessity of knowledge management implementation or not and if they are aware of the value, purpose and role of knowledge generally. As implementation of knowledge management strongly related to information technology, second general question is about IT infrastructures inside the firms. Are Iranian companies ready enough in terms of IT infrastructures to apply KM? And finally maturity of knowledge systems in Iranian oil and gas companies is questioned.

This research is not about finding ways to solve problems of KM implementation, but just wants to find the problems to be a light in future road.

Research objective

Objective of this research is to evaluate main factors that cause problem for applying knowledge management in Iran's oil and gas industry. To gain this main objective this research is going to:

1. To determine extent to which managerial culture inside the organization can affect implementation of KM.
2. To find out level of influence of organizational culture in KM implementation
3. To discover readiness of Iranian oil and gas companies for knowledge management in terms of IT infrastructures.
4. To evaluate goodness of KM strategies in Iran oil and gas industry.
5. To address better way of knowledge management entrance in Iran's oil and gas industry.

Justification of study

As knowledge management is a new concept in managerial world, it is hard to find studies as much as traditional management concepts. Iran's oil and gas industry and in the top NIOC as leader of this industry is looking for utilizing all managerial tools to keep ongoing competition with its regional and global competitors. Currently knowledge management became one of the most important issues for NIOC managers to implement in future. Lots of seminars, conferences and workshops held, but a huge gap in this planning for future is obvious. Preparing to use such an advanced managerial tool, which lots of enormous companies failed to apply, needs a comprehensive study on opportunities and threats.

Going through literature, lack of study on problems that may organization face during application of KM is clear. Even international studies on KM implementation problems do not look sufficient. This research can help managers to classify problems which they already know, and be an alert for them not going through the road without a light.

METHODOLOGY

Theoretical framework

The theoretical framework of the study is given in (Figure 3).

Hypothesis development

H_{1a}: The culture, actions and beliefs of managers about the value and role of knowledge management will cause a problem in knowledge management implementation in Iran's oil and gas industry.
H_{1b}: Having inappropriate organizational culture for embracing knowledge management inside organization will be a problem applying knowledge management in Iran's oil and gas industry.
H_2: Lack of appropriate KM strategy in the firm will be a barrier in implementation of knowledge management in Iranian oil and gas companies.
H_3: Having weak Information technology inside companies will be a problem in implementation of knowledge management in Iran's oil and gas industry.

Developing a sampling plan

Knowledge oriented employees of eight major Iranian oil and gas companies, were targeted population, and data was collected through survey. Knowledge oriented employees of oil and gas companies asked through questionnaires. The sampling design that was being selected is the non-probability sampling. 350 respondents selected from employees of knowledge based organizations in Iran's oil and gas industry. Since this was a self administered survey, 16 respondents fill in the questionnaire with some errors. Therefore, the overall contact rate was around 96%, and final number of respondents was 334 employees.

Data collection

Primary data of this research was collected through self-administrate questionnaires which was distributed among knowledge oriented employees of major Iranian oil and gas companies, mostly under NIOC (National Iranian Oil Company), and two major project consultancy groups, Sazeh and Namvaran. Secondary data collected through Internet, including NIOC and SHANA websites, and also official library of Iran's petroleum company.

One part of the study requires developing a questionnaire. As questionnaire targeted managers, and time limitation is an inevitable characteristic of managers, questionnaire must be to the point and must avoid redundancy to prevent errors. Questionnaire will include 3 main parts. Section A is regarding the respondent demographic, section B asks about factors influencing knowledge management presence and implementation in their company, and Section C is about the result of factors in section B on implementation of knowledge management. Measurement that will be used for section B and section C is the 7 point Likert scale. Likert Scale is a scale format which asks respondents to indicate the extent to which they agree or disagree with a series of mental

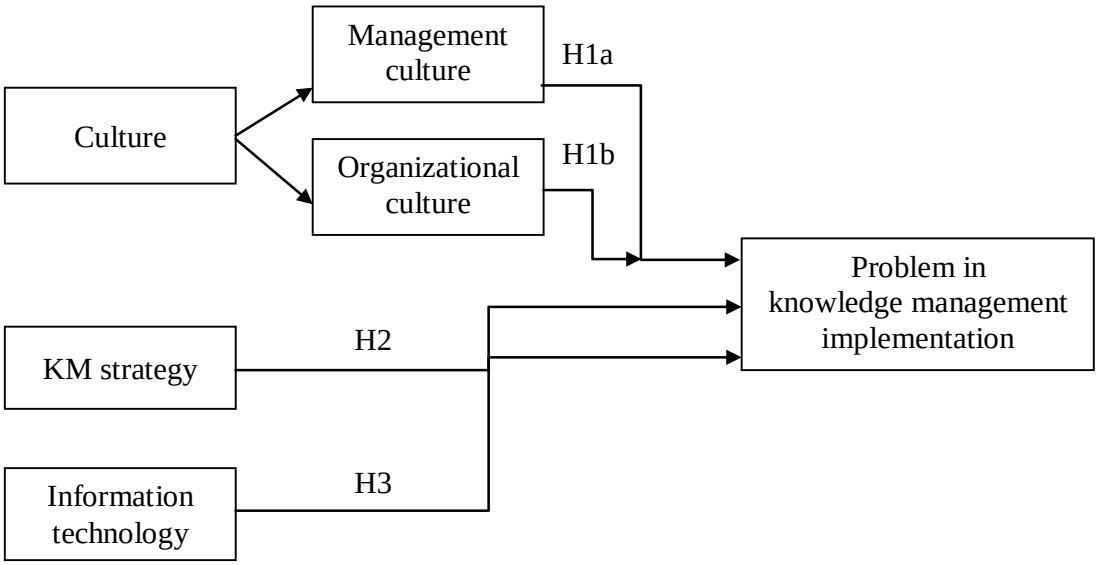

Figure 3. Theoretical framework.

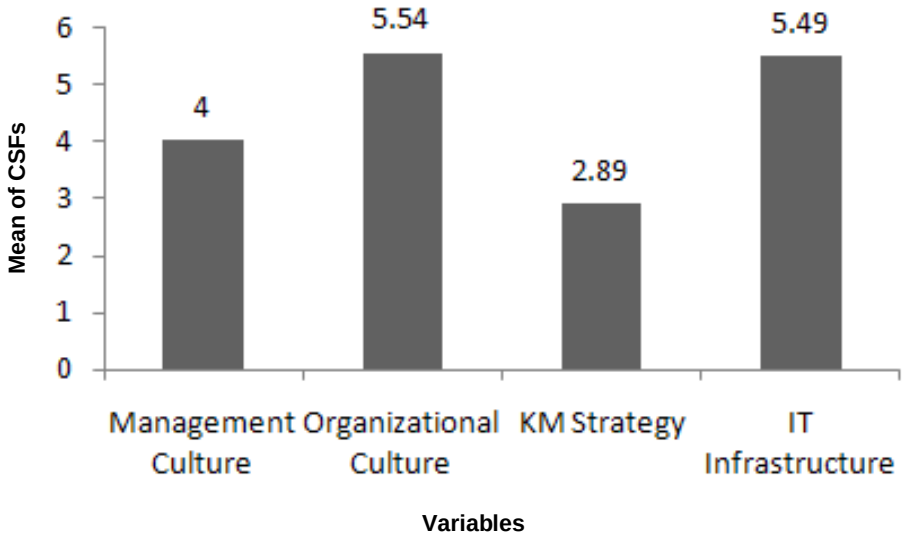

Figure 4. CSF chart.

belief or behavioral belief statements about a given object. For example, “1” represents “Strongly Disagree”, “7” represents “Strongly Agree”. Statistical package for the social sciences (SPSS) Version17 was used for data analysis of this research. Cronbach’s alpha of 0.9 was.

RESULTS AND DISCUSSION

Results from 8 companies show that some factors have more effect on KM implementation, according to 335 knowledge oriented employees view in Table 2. Due to results organizational culture has the most effect on KM implementation. From 1 to 7 which represents “strongly disagree” to “strongly agree” with effect of each factor on KM implementation, organizational culture got 5.55 which shows its huge effect on KM implementation. In contrary, respondents believed that KM strategy got the least impact on KM implementation. IT infrastructure also has a great impact having 5.5. And management culture got 4 which show its moderate impact. From results (Figure 4), it is obvious that no one rate organizational culture under 4 which means no one disagrees with impact of organizational culture on KM implementation. This means level of importance of organizational culture is clear and must be applied in plans. About the management culture, we have answers from strongly disagree to strongly agree that shows high level of uncertainty about role of management in KM implementation. IT infrastructure also

Table 2. Descriptive statistics.

Variable	N	Minimum	Maximum	Mean	Std. deviation
Management culture	335	1	7	4.00	1.430
Organizational culture	335	4	7	5.55	1.054
KM strategies	335	1	5	2.87	1.146
IT	335	3	7	5.50	1.072
Valid N (listwise)	335				

is undoubtedly an important factor that no one really disagrees with its impact on KM implementation. From the results (Figure 4), it can be concluded that three factors out of four have a significant impact on KM implementation and can cause great problems in front of organization in applying knowledge management. Culture, generally, seems to have most effect on KM application that NIOC should create effective procedures to improve culture both organizational and managerial in terms of knowledge management. When KM is not applied yet KM strategy is not a significant factor and it will show it importance right after KM implementation. IT infrastructure is a fundamental and seems to be necessary and is not an option.

Conclusion

Iran's oil and gas industry is going to apply knowledge management in it is subsidiaries. This research wanted to find out main factors that influence KM implementation in Iranian oil and gas companies and can potentially cause problems and make these companies face challenges implementing knowledge management. Due to this aim, 8 major companies of Iranian oil and gas industry selected and 335 knowledge oriented employees were asked.

Results from the research show that organizational culture and IT infrastructure have significant importance in implementation of KM. So, Iran's oil and gas managers have to consider these factors as potential problems and try to improve organizational culture in terms of KM and improve IT infrastructures which has a broader impact in all aspects of organization. But KM strategy is not a big deal. Of course, it is important for managerial board to have a structured plan as KM strategy but in the first step which is KM implementation its importance is less than other major factors. Putting all together, it seems that Iran's oil and gas industry should be careful about two major factors. Culture and IT infrastructure are two important factors that lack of them can cause problems implementing knowledge management. It seems necessary to have more studies to find out methods and techniques to improve readiness of organization facing knowledge management as a new concept in management world. Its suggest to do some research on appropriate KM tools for Iran's oil and gas industry to be the next step after this research.

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