Effective Factors in Establishment of Knowledge Management System in Drilling Industry based on GREY TOPSIS Technique

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Abstract

The roleof Oil and Gas industry regarding Economic, Political and Social aspects is strategically significant. If a country fails to keep its potency and capabilities in Oil and Gas upstream, will lose these strategic points subsequently. Since Drilling industry, represents a major subdivision of upstream, it is crucial to use Dynamic and Efficient Management Systems to keep it up to date. The Knowledge Management System, is a wise choice for this reason. The present study accomplished in order to identify the factors affecting implementation of KMS in Drilling Company and rank themdueto the combination of TOPSIS and Grey Theory. Therefore important effective factors, specified by the Expert Team. The extracted Alternatives rated by linguistic variables. The Linguistic Variables changed to Grey Numbers and then the Alternatives ranked through GREY TOPSIS method. As a results, Organization a factors, ranked as the first priorities, and then Projects Assessment, Having a Proper Organizational Structure respectively as the next priorities. At the end, numbers of practices recommended for KMS implementation in Company.

Keywords: Knowledge Management System, Drilling Industry, Grey TOPSIS.

1. Introduction

Oil Well Drilling is a complicated and important process in oil companies which plays an essential role to maintain and increase the production (AlirezaeiandDashtebozorgi,2008).Given the fact that Iran is one of the oldest oil and gas producing countries and due to its innumerable importance in Economics, considering and using management and engineering methods that can enhance the efficiency of this industry, economic recovery, successful participation in global markets are very important. Knowledge Management System ensures long-term excellence for organizations and communities, and their utilization of "human, intellectual and information" resources. Therefore implementing Knowledge Management System in Drilling Industry plays an important role in the country's economy and its global market (Behrokh, 2015). Knowledge management in organizations is the process by which an organization produces its own wealth of knowledge and intellectual capital and with appropriate design Model will prevent a waste of national wealth (Alvani et al, 2014). The purpose of the knowledge management system is not managing the whole available body of knowledge in the organization, but to manage the part that have the highest significance to the organization.

This purpose is achieved through applying the acquired knowledge and empowering the human resources for utilizing that knowledge to fulfill organizational purposes (Beikar, 2003). Due to the importance of knowledge management in organizations, several studies have been conducted into this subject.(Tavalaei et al,2009). In an attempt to introduce an inclusive model for knowledge management in Iranian oil industry chose the Nonaka and Takeuchi knowledge management model as the desirable model for knowledge management in oil industry and demonstrated its aspects in the industry (Tavalaei et al,2009). Approaching methods of developing knowledge management system in some Iranian oil companies is another research carried out by Bagheri. which based on the situation of Iranian oil industry, presents some recommendations for developing knowledge management system in Iranian oil companies (Bagheri, 2004). In Malaysia, a study is conducted by Muzahmi to investigate the challenges of developing knowledge management system in oil and gas industry, as well (Muzahmi, 2015). Developing knowledge management system in an organization requires proper backgrounds which regardless of whether they are technical or scientific are necessary (Alvaniet all, 2014). Therefore, in this research, the key factors in developing knowledge management system in drilling industry, as one of the most significant industries of the country, are determined and prioritized based on Grey TOPSIS technique. Decision making based on multiple criteria is a subject that discusses resolving the problem by applying nearly inconsistent criteria (Colson and Bruyn, 1989). Each problem might have multiple goals or criteria and the criteria might be inconsistent with each other. Different goals and criteria might have various measuring scales, as well. Resolving these problems might be in the form of producing the best solution or selecting the best one from the existing solutions (Moradi and Akhtarkavan,2009). TOPSIS is one of the most appropriate Multiple Attribute Decision Making (MADM) that is utilized in many studies. TOPSIS is based on the concept that the chosen alternative should have the shortest Euclidian distance from the positive ideal solution (PIS) and the longest geometric distance from the negative ideal solution (NIS) (Asgharpour, 2015). Due to the vast applicability of decision making techniques, they are utilized in several studies in the world and in Iran, as well. For instance, Wood in 2015 applied Multiple Criteria Decision Making TOPSIS with determining 30 criteria, and entropy weighting method to select the supplier for development of oil industry facilities in England (Wood, 2015).

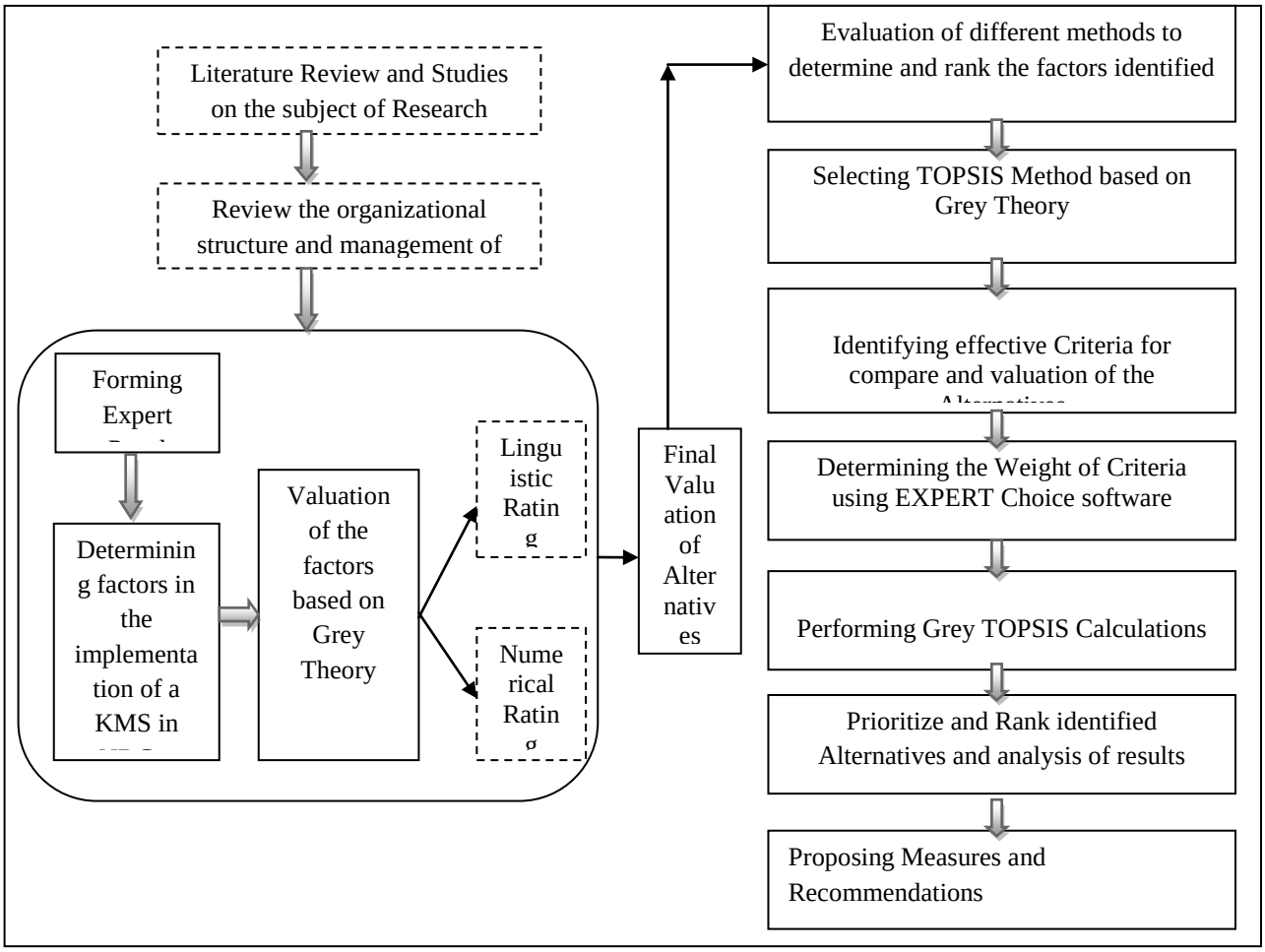
Since in these techniques, the preferential information of alternatives and criteria are presented in the form of decision makers' judgments and the judgments include uncertainties and they cannot be presented in definite statements and numbers, it is necessary to apply some methods to eliminate the uncertainties (Mohammadi and Mollaei, 2010). Therefore, in this research, in order to solve the problems of multi criteria decision making in the situation of uncertainty, a model based on the theory of Grey System is proposed. Generally, the theory of grey systems involves problem solving in the condition of ambiguity and uncertainty including discrete data and incomplete as well, based on the order of similarity or difference of development trends in the data (Nowroziet all, 2014). Grey System Theory, similar to Fuzzy Theory, is an effective mathematical model for solving ambiguous and uncertain problems (Deng,1988) that is used in several researches. For instance, the theories of grey and fuzzy are applied in the analysis of Failure Mode Effect Analysis (FMEA) and breakdowns in oil tankers by Thai and Zhou in Singapore. Utilizing the theories of Grey and Fuzzy in this research improved the prediction of defects and breakdowns events (Zhou & Thai, 2016). Wei et al. applied grey theory to evaluate workplace safety in China to estimate and predict the hazards (Wei et all,2014). In the present research, through combining the MCDM and the Grey Theory techniques, the effective factors in the implementation of knowledge management system in North Drilling Company are identified and ranked. Since North Drilling Company is one of the private companies in drilling sector of oil and gas industry, it is necessary to introduce a management system that is able to improve the efficiency and performance in the company. North Drilling Company operates in both onshore and offshore in all regions of Iran and owns 9 land rigs and 3 Jack-Up rigs and various Drilling Services (Cementing, Tubular Running, RTTS, Mud Logging etc.). NDCO has 2648 employees and provides a variety of technical and drilling services to Iranian and international companies. Since the selected industry in the present research is drilling industry, this company is considered as a case study.

2. Materials and Methods:

In this study, initially Factors Affecting Implementation of Knowledge Management System in North Drilling Company, Identified and verbally valuated by the experts, and then all the factors were ranked according to GREY TOPSIS technique calculations. The flowchart of the steps is provided in Figure 1.

2.1. The Method of evaluating and ranking Factors (Alternatives):

Fig 1: The flowchart of the steps



After determining affecting factors in the implementation of Knowledge Management System based on North Drilling Company's organizational and managerial structures, evaluation factors was performed. In order to identify affecting factors valuation, expertise team was formed and then based on Brain-Storming techniques during meetings; all identified factors rated and evaluated. The Expert Team was formed of 11 Managers and Engineers of North Drilling Company with following academic degrees is shown in table 1.

Table 1: Expert Team Members' Academic Degree

Academic Degree	Number of Experts
PhD	2 Person
M.Sc.	8 Person
B.Sc.	1 Person

2.2. Eigenvector Technique and Expert Choice:

In order to weighting Criteria regarding their effective outcome in the implementation of Knowledge Management System, Eigenvector Technique was employed. Since EXPERT CHOICE software calculations are based on Eigenvector Technique as well, this software used to obtain weighting values for our study.

2.3. GREY TOPSIS Calculations Sequences:

Making decision matrix in which $\mathbf{G_{ij}}$ consists of linguistic variables based on the Grey numbers. To evaluate decision matrix, verbal Grey Numbers presented in Table 2 were used.

Table2: verbal Grey Numbers

Linguistic Variable	Grey Number
Very Poor (VP)	[0 , 1]
Poor (P)	[1 , 3]
Medium Poor(MP)	[3 , 4]
Fair(F)	[4 , 5]
Medium Good(MG)	[5 , 6]
Good(G)	[6 , 9]
Very Good(VG)	[9 , 10]

Table 3: Selected criteria for the comparison of effective factors (Alternatives)

Criterion	C1: Reduce Costs	C2: Reduce Time	C3: Increase Quality	C4: Flexibility in Execution
Value/Entity of Criterion	Positive	Positive	Positive	**Positive**

2.4. Normalizing the Grey Decision matrix:

Normalizing the Grey Decision Matrix to change the various criteria into measurable homogenous units in order to compare as follows. $D = \begin{bmatrix} G11 & G12 & \cdots & G1n \\ G21 & G22 & \dots & G2n \\ \vdots & . & \ddots & \vdots \\ Gm1 & Gm2 & \cdots & Gmn \end{bmatrix}$

1) For Positive Criteria: $$G_{ij}^{*} = \left[\frac{\underline{G_{ij}}}{G_j^{max}}, \frac{\overline{G_{ij}}}{G_j^{max}}\right] where\ G_j^{max} = max_{1\le j\le m}\{\overline{G_{ij}}\}$$

2) For Negative Criteria: $$G_{ij}^{*} = \left[\frac{G_j^{min}}{\overline{G_{ij}}}, \frac{G_j^{min}}{\underline{G_{ij}}}\right] where\ G_j^{min} = min_{1\le j\le m}\{\underline{G_{ij}}\}$$

By normalizing the Grey Decision Matrix all the numbers will be in the [1, 0] interval.

2.5. Forming Weighted Normalized Grey Decision Matrix:

$$D = \begin{bmatrix} V11 & V12 & \cdots & V1n \\ V21 & V22 & \dots & V2n \\ \vdots & . & \ddots & \vdots \\ Vm1 & Vm2 & \cdots & Vmn \end{bmatrix}$$ Where: Vij = Gij* x Wj

In this step the Normalized Grey Decision Matrix will convert to Weighted Normalized Grey Decision Matrix:

2.6. Identify the ideal (Positive) or Positive Ideal Solution (PIS) and non-ideal (Negative) or Negative Ideal Solution (NIS) answers:

$$S^{max} = \begin{Bmatrix} \left[max_{1\le i\le m}\underline{V_{i1}}, max_{1\le i\le m}\overline{V_{i1}}\right], \left[max_{1\le i\le m}\underline{V_{i2}}, max_{1\le i\le m}\overline{V_{i2}}\right], \dots, \\ \left[max_{1\le i\le m}\underline{V_{in}}, max_{1\le i\le m}\overline{V_{in}}\right] \end{Bmatrix}$$

For considered Alternative, the ideal and non-ideal answer can be calculated as follows:

3) $$S^{min} = \begin{Bmatrix} \left[min_{1\le i\le m}\underline{V_{i1}}, min_{1\le i\le m}\overline{V_{i1}}\right], \left[min_{1\le i\le m}\underline{V_{i2}}, min_{1\le i\le m}\overline{V_{i2}}\right], \dots, \\ \left[min_{1<i<m}V_{in}, min_{1<i<m}\overline{V_{in}}\right] \end{Bmatrix}$$

2.7. Calculating Grey Possibility Degree:

In order to calculate Grey Possibility Degree, Alternatives will compare to Positive Ideal Answer using the following equation. In this step the less value is more desirable:

5)

$$P_1 = P\{S_i \le S^{max}\} = \frac{1}{n}\sum_{j-1}^{n} P\{V_{ij} \le G_j^{max}\}$$

Difference between mentioned Grey Possibility Degree of Alternatives and Negative Ideal Solution value is obtained of the following equation. In this step the greater number is more desirable:

6)

$$P_2 = P\{S_i \ge S^{min}\} = \frac{1}{n}\sum_{j-1}^{n} P\{V_{ij} \le G_j^{min}\}$$

2.8. Relative approaching of ideal distance Index:

Relative Approaching of Ideal Distance $\mathbf{C_i}$ is calculated with following equation:

7)

$$\mathbf{C_i} = \frac{P1}{P2}$$

3. Results and Conclusion:

Considering the required infrastructures for implementing Knowledge Management System and based on Expert Team opinions four effective Criteria for Comparison and Evaluation of the superiority and priority of each ALTERNATIVE were identified (is Shown in Table 3). According to the studies carried out in this research and the results of the review of the necessary infrastructure for establishing a knowledge management system in the North Drilling Company, the most important factors affecting the establishment and implementation of the knowledge management system has been in the five main groups (five factors).Each of the assigned factors has subsets that are considered as Alternatives, as presented in Table 4.

Table 4: Identified Effective Factors (Research Alternatives)

A1: Human Factors	A11: General Personal Skills / A12: Personnel's knowledge and information of Management Systems / A13: Personnel approach and participation in Training and organizational Culture / A14: Personal Innovation and Creativity
A2: Information Technology(IT) Factors	A21: IT Structure's Performance and Applicability / A22: IT System Security / A23: IT Software System's Integrity / A24: Software User-Friendliness / A25: IT Network's Inclusiveness in various organization levels
A3: Organizational Factors	A31: Leadership Commitment / A32: Dynamic Organizational Culture / A33: Organizational Reinforcement Systems and Procedures / A34: Developing a vision and strategy for knowledge management with a competitive approach / A35: The existence of a proper and standard organizational structure / A36: Integration of organizational management systems / A37: Succession planning of organization / A38: Recruitment and promotion of human resources based on meritocracy
A4: External Environment Factors	A41: Competitive knowledge management system (comparing with competitors) / A42: Linking KM projects with organization's strategies (short, medium and long term scales) / A43: Justifying projects based on the value creation of knowledge management for business
A5: Training / Assessment Factors	A51: Training Personnel how to transfer knowledge to individuals / A52: Designing appropriate assessment and audit mechanisms / A53: Personnel training on the effects of KM in the organization

3.1. Preparation of Decision Matrix and Linguistic Valuation of Options and Criteria

The valuation of the Alternatives and criteria was done according to the Expert Team opinions using Brain Storming method, according to the tables of Grey Linguistic variables.

Due to the multiplicity of tables for the valuation of the Alternatives (A1 to A5), an example of the prepared matrices (A3: the organizational factors and its Subdivisions) is presented in Tables 5 and 6.

Table 5:the linguistic values of Organizational Factors considering criteria

Criterion Alternative	C1: Reduce Costs	C2: Reduce Time	C3: Increase Quality	C4: Flexibility in Execution
A31: Leadership Commitment	FAIR (F)	MEDIUM GOOD (MG)	FAIR (F)	MEDIUM GOOD (MG)
A32: Dynamic Organizational Culture	MEDIUM POOR (MP)	FAIR (F)	MEDIUM GOOD (MG)	MEDIUM GOOD (MG)
A33: Organizational Reinforcement Systems and Procedures	POOR (P)	POOR (P)	MEDIUM POOR (MP)	FAIR (F)
A34: Developing a vision and strategy for knowledge management with a competitive approach	POOR (P)	VERY POOR (VP)	MEDIUM GOOD (MG)	POOR (P)
A35: The existence of a proper and standard organizational structure	FAIR (F)	MEDIUM POOR (MP)	POOR (P)	MEDIUM POOR (MP)
A36: Integration of organizational management systems	FAIR (F)	MEDIUM POOR (MP)	MEDIUM GOOD (MG)	POOR (P)
A37: Succession planning of organization	POOR (P)	VERY POOR (VP)	POOR (P)	POOR (P)
A38: Recruitment and promotion of human resources based on meritocracy	FAIR (F)	MEDIUM POOR (MP)	FAIR (F)	MEDIUM POOR (MP)

Table 6: :Numerical ranking of Organizational Factors Alternatives based on criteria

Criterion Alternative	C1: Reduce Costs		C2: Reduce Time		C3: Increase Quality		C4: Flexibility in Execution	
A31: Leadership Commitment	4	5	5	6	4	5	5	6
A32: Dynamic Organizational Culture	3	4	4	5	5	6	5	6
A33: Organizational Reinforcement Systems and Procedures	1	3	1	3	3	4	4	5
A34: Developing a vision and strategy for knowledge management with a competitive approach	1	3	0	1	5	6	1	3
A35: The existence of a proper and standard organizational structure	4	5	3	4	1	3	3	4
A36: Integration of organizational management systems	4	5	3	4	5	6	1	3
A37: Succession planning of organization	1	3	0	1	1	3	1	3
A38: Recruitment and promotion of human resources based on meritocracy	4	5	3	4	4	5	3	4

Table 7: Results of calculating weights of Criteria

Criteria	**Reduce Costs**	**Reduce Time**	**Increase Quality**	**Flexibility in Execution**
Obtained Weight	0.27982138	0.1827428	0.31781476	**0.219621059**
Rank	2	4	1	**3**
Inconsistency rate : 0.00042				

The results obtained from Expert Choice software are as follows (Table 7).

3.3. GREY TOPSIS Calculations

3.3.1. Calculation results of Normalized Grey Matrix (is Shown in Table 8).

Table 8: Calculation results of Normalized Grey Matrix

		C_1		C_2		C_3			C_4	
$A_{1.1}$		0.666666667	1	0.5	0.666667	0.6	0.9		0.666666667	0.833333
$A_{1.2}$		0.555555556	0.666667	0.666667	0.833333	0.6	0.9		0.666666667	0.833333
$A_{1.3}$		0.666666667	1	0.666667	0.833333	0.9	1		0.5	0.666667
$A_{1.4}$		0.333333333	0.444444	0.5	0.666667	0.3	0.4		0.833333333	1
$A_{2.1}$		0.111111111	0.333333	0.166667	0.5	0.4	0.5		0.5	0.666667
$A_{2.2}$		0.333333333	0.444444	0.166667	0.5	0.4	0.5		0.5	0.666667
$A_{2.3}$		0.555555556	0.666667	0.5	0.666667	0.4	0.5		0.166666667	0.5
$A_{2.4}$		0.333333333	0.444444	0.166667	0.5	0.3	0.4		0.166666667	0.5
$A_{2.5}$		0.111111111	0.333333	0.166667	0.5	0.4	0.5		0.5	0.666667
$A_{3.1}$		0.444444444	0.555556	0.833333	1	0.4	0.5		0.833333333	1
$A_{3.2}$		0.333333333	0.444444	0.666667	0.833333	0.5	0.6		0.833333333	1
$A_{3.3}$		0.111111111	0.333333	0.166667	0.5	0.3	0.4		0.666666667	0.833333
$A_{3.4}$		0.111111111	0.333333	0	0.166667	0.5	0.6		0.166666667	0.5
$A_{3.5}$		0.444444444	0.555556	0.5	0.666667	0.1	0.3		0.5	0.666667
$A_{3.6}$		0.444444444	0.555556	0.5	0.666667	0.5	0.6		0.166666667	0.5
$A_{3.7}$		0.111111111	0.333333	0	0.166667	0.1	0.3		0.166666667	0.5
$A_{3.8}$		0.444444444	0.555556	0.5	0.666667	0.4	0.5		0.5	0.666667
$A_{4.1}$		0.111111111	0.333333	0.166667	0.5	0.3	0.4		0.166666667	0.5
$A_{4.2}$		0.444444444	0.555556	0.5	0.666667	0.4	0.5		0.166666667	0.5
$A_{4.3}$		0.111111111	0.333333	0.166667	0.5	0.3	0.4		0.166666667	0.5
$A_{5.1}$		0.444444444	0.555556	0.5	0.666667	0.6	0.9		0.666666667	0.833333
$A_{5.2}$		0.444444444	0.555556	0.5	0.666667	0.4	0.5		0.666666667	0.833333
$A_{5.3}$		0.555555556	0.666667	0.166667	0.5	0.4	0.5		0.166666667	0.5

3.3.2. Converting Table 10 to Weighted Normalized Grey Matrix with multiplying the Weight of each Criterion (is Shown in Table 9).

Table 9: Weighted Normalized Grey Matrix

	C_1		C_2		C_3			C_4	
$A_{1.1}$	0.18654758	0.279821	0.0913714	0.121829	0.190688854	0.286033		0.1464140	0.183018
$A_{1.2}$	0.15545632	0.186548	0.1218285	0.152286	0.190688854	0.286033		0.1464140	0.183018
$A_{1.3}$	0.18654758	0.279821	0.1218285	0.152286	0.286033281	0.317815		0.1098105	0.146414
$A_{1.4}$	0.09327379	0.124365	0.0913714	0.121829	0.095344427	0.127126		0.1830175	0.219621
$A_{2.1}$	0.03109126	0.093274	0.0304571	0.091371	0.127125903	0.158907		0.1098105	0.146414
$A_{2.2}$	0.09327379	0.124365	0.0304571	0.091371	0.127125903	0.158907		0.1098105	0.146414
$A_{2.3}$	0.15545632	0.186548	0.0913714	0.121829	0.127125903	0.158907		0.0366035	0.109811
$A_{2.4}$	0.09327379	0.124365	0.0304571	0.091371	0.095344427	0.127126		0.0366035	0.109811
$A_{2.5}$	0.03109126	0.093274	0.0304571	0.091371	0.127125903	0.158907		0.1098105	0.146414
$A_{3.1}$	0.12436505	0.155456	0.1522857	0.182743	0.127125903	0.158907		0.1830175	0.219621
$A_{3.2}$	0.0932737	0.124365	0.1218285	0.152286	0.158907378	0.190689		0.1830175	0.219621
$A_{3.3}$	0.0310912	0.093274	0.0304571	0.091371	0.095344427	0.127126		0.1464140	0.183018
$A_{3.4}$	0.0310912	0.093274	0	0.030457	0.158907378	0.190689		0.0366035	0.109811
$A_{3.5}$	0.1243650	0.155456	0.0913714	0.121829	0.031781476	0.095344		0.1098105	0.146414
$A_{3.6}$	0.1243650	0.155456	0.0913714	0.121829	0.158907378	0.190689		0.0366035	0.109811
$A_{3.7}$	0.0310912	0.093274	0	0.030457	0.031781476	0.095344		0.0366035	0.109811
$A_{3.8}$	0.1243650	0.155456	0.0913714	0.121829	0.127125903	0.158907		0.1098105	0.146414
$A_{4.1}$	0.0310912	0.093274	0.0304571	0.091371	0.095344427	0.127126		0.0366035	0.109811
$A_{4.2}$	0.1243650	0.155456	0.0913714	0.121829	0.127125903	0.158907		0.0366035	0.109811
$A_{4.3}$	0.0310912	0.093274	0.0304571	0.091371	0.095344427	0.127126		0.0366035	0.109811
$A_{5.1}$	0.1243650	0.155456	0.0913714	0.121829	0.190688854	0.286033		0.1464140	0.183018
$A_{5.2}$	0.1243650	0.155456	0.0913714	0.121829	0.127125903	0.158907		0.1464140	0.183018
$A_{5.3}$	0.1554563	0.186548	0.0304571	0.091371	0.127125903	0.158907		0.0366035	0.109811

3.3.3. Identifying Ideal (Positive - PIS) and Non-Ideal (Negative -NIS) Solutions (is Shown in Table 10).

Table 10: Ideal and Non-Ideal Solutions

S MAX	0.186547	0.2798	0.152285	0.182743	0.286033	0.31781	0.1830175	0.21962
S MIN	0.031091	0.093274	0	0.030457	0.0317814	0.095344	0.036603	0.10981

3.3.4. Calculating Gray Possibility Degree (is Shown in Table 11).

Table 11: Grey Possibility Degree Calculations

P (s i< S max)	Value	P (s i ≥ S MIN)	Value
P (s 1 < S max)	0.875	P (s 1 ≥ S MIN)	0
P (s 2 < S max)	1	P (s 2 ≥ S MIN)	0
P (s 3 < S max)	0.75	P (s 3 ≥ S MIN)	0
P (s 4 < S max)	0.875	P (s 4 ≥ S MIN)	0
P (s 5 < S max)	1	P (s 5 ≥ S MIN)	0.125
P (s 6 < S max)	1	P (s 6 ≥ S MIN)	0
P (s 7 < S max)	1	P (s 7 ≥ S MIN)	0.125
P (s 8 < S max)	1	P (s 8 ≥ S MIN)	0.125
P (s 9 < S max)	1	P (s 9 ≥ S MIN)	0.125
P (s 10 < S max)	0.75	P (s 10 ≥ S MIN)	0
P (s 11 < S max)	0.875	P (s 11 ≥ S MIN)	0
P (s 12 < S max)	1	P (s 12 ≥ S MIN)	0.125
P (s 13 < S max)	1	P (s 13 ≥ S MIN)	0.375
P (s 14 < S max)	1	P (s 14 ≥ S MIN)	0.125
P (s 15 < S max)	1	P (s 15 ≥ S MIN)	0.125
P (s 16 < S max)	1	P (s 16 ≥ S MIN)	0.5
P (s 17 < S max)	1	P (s 17 ≥ S MIN)	0
P (s 18 < S max)	1	P (s 18 ≥ S MIN)	0.25
P (s 19 < S max)	1	P (s 19 ≥ S MIN)	0.125
P (s 20 < S max)	1	P (s 20 ≥ S MIN)	0.25
P (s 21 < S max)	1	P (s 21 ≥ S MIN)	0
P (s 22 < S max)	1	P (s 22 ≥ S MIN)	0
P (s 23 < S max)	1	P (s 23 ≥ S MIN)	0.125

3.3.5. Relative Approaching Index calculations and ranking the Alternatives due to the results (is Shown in Table *12)*.

Table 12: The Final results of Ranking Alternatives

Cl_i	Alternative
CL_1	Developing a vision and strategy for knowledge management with a competitive approach
CL_2	A37: Succession planning of organization
CL_3	Dynamic Organizational Culture
CL_4	Justifying projects based on the value creation of knowledge management for business
CL_5	Competitive knowledge management system (comparing with competitors)
CL_6	The existence of a proper and standard organizational structure
CL_7	Integration of organizational management systems
CL_8	Leadership Commitment
CL_9	Organizational Reinforcement Systems and Procedures
CL_{10}	Personnel training on the effects of KM in the organization
CL_{11}	Software User-Friendliness
CL_{12}	IT Network's Inclusiveness in various organization levels
CL_{13}	General Personal Skills
CL_{14}	Personnel’s knowledge and information of Management Systems
CL_{15}	Recruitment and promotion of human resources based on meritocracy
CL_{16}	Personnel approach and participation in Training and organizational Culture
CL_{17}	Linking KM projects with organization’s strategies (short, medium and long term scales)
CL_{18}	Training Personnel how to transfer knowledge to individuals
CL_{19}	IT Structure's Performance and Applicability
CL_{20}	IT Software System's Integrit
CL_{21}	Designing appropriate assessment and audit mechanisms
CL_{22}	Personal Innovation and Creativity
CL_{23}	IT System Security

Conclusion

According to the results of this research, in order to establish a knowledge management system in North Drilling Company, first, the factors determined based on the priorities shall be examined, and the barriers to the realization of these factors shall be eliminated. Afterwards, the implementation of knowledge management system includes defining the goals of the knowledge, identifying, acquiring, developing, sharing, utilizing, applying, retaining and evaluating the knowledge. According to the results of the present research, and previous studies as well, in many of the organizations, the organizational factors have been recognized as the most important effective factors in developing and implementation of the KMS. Salavati and HaghNazar investigated the basic effective factors in implementation of the knowledge management system in the headquarters of National Iranian Oil Company. The results showed that the structure and culture of the organization in National Iranian Oil Company have the less readiness to introduce the knowledge management system and they should be the first priorities to be improved (Salavati and HaghNazar, 2009).

Based on the results of the present research, major advantages of implementing knowledge management system include:

- Diagnosing deficiencies in the knowledge of organization
- Acquiring competitive advantages
- Improving the efficiency of the human resources
- More efficiently and effectively learning
- Improving customers' satisfaction
- Creating new opportunities
- Preventing from repeating mistakes and decreasing redoing tasks
- Saving more time in problem solving process
- Preventing loss of knowledge in organization
- Inspiring creativity and innovation
- Building closer relationships with customers
- Improving the performance of the organization by increasing efficiency, quality and innovation
- Possibility of utilizing other people's knowledge to accomplish tasks
- Increasing the speed of access to the required knowledge and reducing the time spent on doing the tasks and the possibility of individuals' access to their codified knowledge package which is acquired during years of service.

However, it is obvious that a knowledge management system as well as any other management systems encounters barriers in the way of being developed in an organization, which shall be considered. The most important barriers to developing the knowledge management system in an organization include:

- Organizational culture (Lack of trust, interpersonal interaction and knowledge sharing)
- Lack of consciousness and apprehension (understanding) of knowledge management
- Hierarchical and non-flexible structures
- Lack of Managerial support for the programs of the knowledge management system
- Lack of culture of participation and mutual trust in organizational culture
- Lack of constructive connection and interaction-connection between knowledge management system and organizational strategies
- Lack of pervasive value in the efforts of knowledge management system

The results of the present research suggests that in order to implement knowledge management system in North Drilling Company (as a case study) factors including devising a proper structure for knowledge management, allocating skilled human resources (personnel / employees) to it, devising a strategy for knowledge management in North Drilling Company, defining the criteria and evaluating standards of knowledge management and offering training programs taught by experts of knowledge management shall be the top priorities Since developing knowledge management system in many of the industries, organizations and companies can increase the efficiency and profitability and considering the benefits of knowledge management system and its significance in preventing the loss of organizational resources and its success in international market, it is suggested that the key factors to develop the system in other industrial sections and organizations of the country shall be investigated.

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