Prioritization Of Construction Contracts In The Oil And Gas Fields (Using The Fuzzy Topsis Method) And Comparing The Alliance Method In Common Fields With Them

ALI RAHIMI[1], DR. ARASH SAYARI*[2], DR. HEIRSH SULTANPANAH[3], DR. SALAR MANIE[4]

1 PhD Student, Department of Civil Engineering, Sanandaj Branch, Islamic Azad University, Sanandaj, Iran. Email: rahimi_1169@yahoo.com
2 Assistant Professor, Department of Civil Engineering, Sanandaj Branch, Islamic Azad University, Sanandaj,Iran). Email: sayari_51@yahoo.com
3 Assistant Professor, Department of Industrial Engineering, Sanandaj Branch, Islamic Azad University, Sanandaj, Iran. Email: heresh@iausdj.ac.ir
4 Assistant Professor, Department of Civil Engineering, Sanandaj Branch, Islamic Azad University, Sanandaj,Iran. Email: manie@iausdj.ac.ir
** Corresponding Author: Arash Sayari*

Abstract:

In countries with oil and gas reservoirs, different methods of contracts have been used to exploit these resources. In this research, we investigated the types of construction contracts in the field of oil and gas, including 7 previous important models as well as the designed model, i.e. a total of 8 types of contracts and their ranking, and comparing the alliance method with other contracts using the fuzzy TOPSIS multi-criteria decision making technique.

research method:

The conducted research is of an applied type and in terms of data collection, it is a mixed (qualitative-quantitative) type of research. The experts were interviewed and the indicators were extracted. In this research, Excel software was used, and in order to prioritize contracts and compare the alliance method with other methods of construction contracts, the fuzzy TOPSIS multi-criteria technique was used.

Conclusion:

Based on the analysis, it was determined that the OPC alliance method contract was suitable for joint fields and in the ranking, in terms of important and influential indicators in the success of construction contracts, as well as field protection, **environmental protection, sustainable development**, transfer of knowledge and experience, and other important indicators related to contracts, according to experts, Cli=0.79 has a favorable rating. In this research, for fields that have been explored and have adequate reserves of oil and gas and common fields, the worst type of contract was determined by the scoring method with Cli=0.209.

Key words: *construction contracts, oil and gas field, multi-criteria decision making, fuzzy TOPSIS technique*

This article is taken from the dissertation for receiving a specialized doctorate degree in civil engineering, majoring in civil engineering and construction management, with the title of designing a model for concluding construction contracts (in the field of oil and gas) through multi-criteria decision-making techniques at the Islamic Azad University of Iran, Sanandaj branch.

 https://doi.org/10.37896/pd93.1/93111

ISSN: 0369-8963

Introduction :

Many regions of the world have rich oil and gas resources and they have exploited those resources to explore and exploit them in different ways and by using one of the types of contracts according to the oil and gas field and the international conditions and the rules and laws of that country.

For countries with oil and gas reservoirs, in addition to obtaining maximum profit and ensuring the interests of shareholders, four desirable features in oil and gas contracts include: sovereignty and ownership of oil and gas resources, respect for national rights and interests during oil and gas operations, transfer of appropriate technical knowledge and skills, and increasing the government's share of oil and gas revenues. (Kaiser[1],2020).

By examining the types of contracts available in this field, we noticed different strengths and weaknesses. According to the needs of the world and Iran and other countries that have common oil and gas reservoirs, the OPC alliance model was designed for common reservoirs and preserving the environment and collecting gases and gas condensates along with oil and preserving data and imparting knowledge and technology, value engineering, strengthening the economy of the countries that own the reservoirs and preventing the sale of crude oil and creating added value by building petrochemical parks and the conversion of oil and gas into oil derivatives and valuable products causes currency gain, employment and sustainable development for the owner of oil and gas tanks. In this research, contracts were ranked using fuzzy TOPSIS method. Since the use of the opinions of experts in this field and accurate statistical methods can provide acceptable results, we have investigated the issue by using qualitative and quantitative models. (Rahimi, Sayari et al., 2022)

1. Research background

In addition to appropriate political developments between countries, currency conversion, unit performance, fuel costs and inflation, having a favorable financial system are among the important factors of development in the field of oil and gas (Kripa and Jaffa[2], 2020).

According to the studies conducted in the field of oil contracts in other countries, Jaff believes that production participation contracts with foreign companies along with domestic financial resources in Iraq's oil industry can make Iraq one of the successful countries in the field of oil in the region and the world. (Jaffe[3], 2019).

In case of observing the principles of "sovereignty and ownership", "guaranteeing safety withdrawal from the field" regarding the maximum use of the engineering power of the country that owns the reservoir, it should not be negligent in the matter of oil and gas contracts (Qolipour and Nasiri Khansari, 2015).

Identifying foreign financing methods and evaluating their ranking is based on three indicators of risk and cost of capital and total risk and cost of capital for foreign financing methods for priority use in the oil industry, in order of preference for cross-selling, lines of credit, guaranteed loans, and financing (Jalili et al., 2019). . Decision criteria for concluding contracts in the upstream sector of oil and gas industries are divided into two general categories: pre-contract criteria and intra-contract criteria. (Momini Wasalian et al., 2018).

 https://doi.org/10.37896/pd93.1/93111

ISSN: 0369-8963

[1] Kayser
[2] Kripa and Xhafa
[3] Jaffe

2. Strengths and weaknesses of all types of oil contracts in the world

Row	contract type	Strengths	weakness
1	Franchise contracts	Transferring the risk of exploration risk to the appropriate investor for unproven oil areas suitable for hard-to-reach areas such as deep seas	Non-compliance with the government's sovereignty and ownership Lack of transfer of knowledge and technology in the stages of exploration and exploitation The benefits of the host country are limited to ownership interests and taxes A relatively long time
2	Production participation contracts	The country's ownership of part of the reservoirs and part of the production, the sovereignty of the reservoir owner over all exploration and exploitation operations The possibility of transferring the software technology part of the production, according to the contract	Vulnerability of joint exploration and enforcement operations In case of crisis and damage to the investor, the oil field will not be used Pre-production risk in contracts
3	Mutual sale contracts (Buy Back)	Dependence of contractor fee payment on capital expenditure, control of operation, cost and production by the host government Manpower training The payment will be based on the income from the sale of the product according to the schedule after the start of production	Poor supervision of the employer on the performance of contractors, low flexibility of the contract, lack of commitment of the contractor in operation
4	Direct investment or finance contracts	Financing is with limited commitment or without commitment, and the repayment of the facility is from the source of the project's income. The yield rate of oil and gas projects is	Non-commitment of the facilitator to achieve the plan If there is a delay in the operation of the project, it is not cost-effective for the unconventional cost of insurance due to the high

https://doi.org/10.37896/pd93.1/93111

ISSN: 0369-8963

		lower than the interest rate of facilities Long-term contract	investment risk
5	Engineering, purchase and construction EPC method contracts,	Very high speed of work, reducing the responsibilities of the employer, reducing the total price of the project	The impossibility of complaints and failure to adhere to the commitment by the contractor (claim)
6	Contracts in oil-rich areas in the south, job based	The reservoir owner's sovereignty over all exploration and exploitation operations Reducing the opportunism of the contractor and the cost of the project Commitment and technical, financial and executive support of the contractor Reducing the risk for the employer	Insisting and always making raw sales Lack of attention to integrated development in common fields with other countries
7	IPC Iran oil contracts	High contract flexibility Realization of maintenance production and maximum recovery from the tank Realization of maximum production and based on the IPC contract Partnering with a foreign company in the stages of oil discovery, exploitation, field development and extraction	The dependence of the contractor's fee payment on the amount of production from the field, reducing the supervisory role of the employer Failure to include the penalty in case of damage to the tank and loss of primary field production. Lack of attention to integrated development in common fields with other countries The long-term nature of the contract and the possibility of weakening the internal power and the fusion of internal forces among foreign companies and the departure of Iranian experts to these companies.
8	OPC alliance model	Sovereignty of reservoir owners over all exploration and exploitation operations Very fast work Reducing employer's responsibilities Reducing the cost of the project	The newness of the contract

https://doi.org/10.37896/pd93.1/93111

ISSN: 0369-8963

		Realization of maintenance production and maximum recovery from the tank Achieve maximum production Special attention to the environment and sustainable development Preventing crude sales and creating added value by building petrochemical parks and producing knowledge-based products	

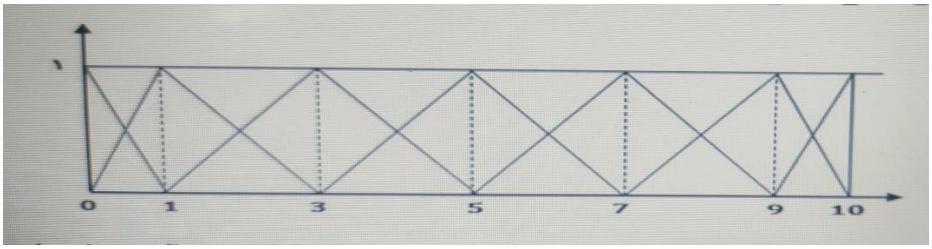
3. Research Methodology

In this research, important and effective indicators in construction contracts in the field of oil and gas were extracted through interviews with experts in this field and extracted after going through the final processes. The research is based on the goal, it is applied and it is a type of mixed exploratory research (qualitative-quantitative). In this research, Excel software was used and fuzzy TOPSIS technique was used to prioritize contracts and compare the alliance method with other methods of construction contracts.

4. Fuzzy TOPSIS method

For the first time, Chen (2000) used the TOPSIS technique with a fuzzy approach in an article entitled TOPSIS method extension to group decision making in a fuzzy environment. To perform the calculations of the TOPSIS technique in a fuzzy manner, first, a suitable language range should be used for data collection. Chen (2000) proposes a seven-point linguistic scale to score each option based on each criterion. Also, the decision matrix can be used to rank the importance of criteria with a technique such as entropy, so Chen has proposed a similar spectrum for ranking criteria. It has also been explained in the discussion of the TOPSIS questionnaire design, usually in the qualitative evaluation of options in the TOPSIS technique, definitive numbers from the nine-point Likert scale are used. In the qualitative evaluation of options in the fuzzy TOPSIS technique, a seven-degree scale is usually used.

The range of seven degrees proposed in the evaluation of options for the fuzzy TOPSIS technique is as follows:



 https://doi.org/10.37896/pd93.1/93111

ISSN: 0369-8963

5. **Investigating influential factors in construction contracts in the oil and gas field using TOPSIS technique algorithm:**

First step - formation of the decision matrix

In TOPSIS technique, m options are evaluated using n criteria. Therefore, each option is given a score based on each criterion. These scores can be based on quantitative and real values or qualitative and theoretical. In any case, an m*n decision matrix must be formed.

Row	contract type	Effective indicators in the contract					
		Ownership of the field	Time	return on investment	Protection from the field	environmental	Transfer of knowledge and experience
		advantage	advantage	advantage	Disadvantages	Disadvantages	Disadvantages
1	Franchise contracts	very little	Much	medium	Much	Much	Much
2	Participation in production	medium	Much	Much	Low	Low	medium
3	Buy Back	medium	Much	medium	medium	medium	medium
4	Direct investment or finance	medium	Much	medium	medium	medium	very little
5	Engineering, Procurement and Construction (EPC)	very much	very much	very much	very little	Low	very little
6	Job Based contracts	Much	Much	Much	very little	medium	Low
7	IPC Iran oil contracts	Much	very much	medium	Low	medium	Low
8	Alliance (OPC)	very much	very much	very much	very little	very little	very little

Table 1. Decision matrix

https://doi.org/10.37896/pd93.1/93111

ISSN: 0369-8963

Table 2. Converting factors affecting the success or failure of construction contracts in the field of oil and gas using TOPSIS

Row	contract type	Effective indicators in the contract					
		Ownership of the field	Time	return on investment	Protection from the field	environmental	Transfer of knowledge and experience
		C1	C2	C3	C4	C5	C6
1	Franchise contracts	1	6	5	3	3	3
2	Participation in production	4	7	7	7	7	5
3	Buy Back	5	6	5	5	5	5
4	Direct investment or finance	5	7	5	5	5	9
5	Engineering, Procurement and Construction (EPC)	8	9	8	9	7	9
6	Job Based contracts	7	7	7	8	5	7
7	IPC Iran oil contracts	6	8	6	7	5	7
8	Alliance (OPC)	10	9	9	10	9	10

technique algorithm into fuzzy numbers

Second step - normalizing the decision matrix

Like other multi-criteria decision making methods, the decision matrix should be normalized. The vector method is used to normalize the values. The vector method, unlike the simple linear normalization method, is performed as follows:

$$n_{ij} = \frac{x_{ij}}{\sqrt{\sum_{1}^{m} x_{ij}^{2}}}$$

https://doi.org/10.37896/pd93.1/93111

ISSN: 0369-8963

Table 3. Normalize the matrix

Row	contract type	Effective indicators in the contract					
		Ownership of the field	Time	return on investment	Protection from the field	environmental	Transfer of knowledge and experience
		C1=0.25	C2=0.21	C3=0.19	C4=0.12	C5=0.11	C6=0.12
1	Franchise contracts	0.056	0.284	0.266	0.150	0.177	0.147
2	Participation in production	0.225	0.332	0.372	0.349	0.412	0.244
3	Buy Back	0.281	0.284	0.266	0.249	0.295	0.244
4	Direct investment or finance	0.281	0.332	0.266	0.249	0.295	0.440
5	Engineering, Procurement and Construction (EPC)	0.450	0.427	0.425	0.449	0.412	0.440
6	Job Based contracts	0.394	0.332	0.372	0.399	0.295	0.342
7	IPC Iran oil contracts	0.338	0.379	0.319	0.349	0.295	0.342
8	Alliance (OPC)	0.563	0.427	0.478	0.449	0.412	0.440

The third step - forming the normal weighted decision matrix (weighting the normalized matrix)

The next step is to form the weighted normal matrix based on the weight of the criteria. Therefore, the weights of the criteria should be calculated using a technique such as AHP or Shannon's entropy. Weighting is very simple, and the weight of each criterion is multiplied by the corresponding weights of that criterion.

The set of weights (w) is multiplied by the normalized matrix (R).

$$W = \left(w_1 w_2 \ldots w_j \ldots w_n \right) \qquad \sum_{j=1}^{n} w_j = 1 \qquad (2)$$

For the weighted importance of field ownership C1=0.25, time C2=0.21, return on investment C3=0.19, field protection C4=0.12, environment C5=0.11 and transfer of knowledge and experience C6=0.12 are considered.

https://doi.org/10.37896/pd93.1/93111

ISSN: 0369-8963

Table 4. Weighting the normalized matrix

Row	contract type	Effective indicators in the contract					
		Ownership of the field	Time	return on investment	Protection from the field	environmental	Transfer of knowledge and experience
		C1=0.25	C2=0.21	C3=0.19	C4=0.12	C5=0.11	C6=0.12
1	Franchise contracts	0.014	0.060	0.050	0.018	0.019	0.018
2	Participation in production	0.056	0.070	0.071	0.042	0.045	0.029
3	Buy Back	0.070	0.060	0.050	0.030	0.032	0.029
4	Direct investment or finance	0.070	0.070	0.050	0.030	0.032	0.053
5	Engineering, Procurement and Construction (EPC)	0.113	0.090	0.081	0.054	0.045	0.053
6	Job Based contracts	0.098	0.070	0.071	0.048	0.032	0.041
7	IPC Iran oil contracts	0.084	0.080	0.061	0.042	0.032	0.041
8	Alliance (OPC)	0.141	0.090	0.091	0.054	0.045	0.053

Fourth step - calculation of positive and negative ideals

Calculation of Positive ideal point, PIS and Negative ideal point, NIS is the next step. In this step, a positive ideal (A+) and a negative ideal are calculated for each index.

For criteria that have a positive load, the positive ideal is the largest value of that criterion.

For criteria that have a positive charge, the negative ideal is the smallest value of that criterion.

For criteria that have a negative load, the positive ideal is the smallest value of that criterion.

For criteria that have a negative load, the negative ideal is the largest value of that criterion.

$$\text{Positive ideal point } A^{*} = \left\{ \left(\max_i v_{ij} \middle| j \in J \right) \text{و} \left(\min_i v_{ij} \middle| j \in J' \right) \middle| i = 1 \text{و} 2 \text{و} \ldots \text{و} m \right\} = \left\{ v_1^{*} \text{و} v_2^{*} \text{و} \cdots \text{و} v_j^{*} \text{و} \cdots \text{و} v_n^{*} \right\}$$

$$\text{Negative ideal point } A^{-} = \left\{ \left(\min_i v_{ij} \middle| j \in J \right) \text{و} \left(\max_i v_{ij} \middle| j \in J' \right) \middle| i = 1 \text{و} 2 \text{و} \ldots \text{و} m \right\} = \left\{ v_1^{-} \text{و} v_2^{-} \text{و} \cdots \text{و} v_j^{-} \text{و} \cdots \text{و} v_n^{-} \right\}$$

https://doi.org/10.37896/pd93.1/93111

ISSN: 0369-8963

Determining the best and worst answers

Table 5. The best and worst answers

Row		Ownership of the field	Time	return on investment	Protection from the field	environmental	Transfer of knowledge and experience
1	V+	0.141	0.090	0.091	0.018	0.019	0.018
2	V-	0.014	0.060	0.050	0.054	0.045	0.053

Fifth step - distance from positive and negative ideals (obtaining the size of the distances)

In this step, the relative closeness of each option to the ideal solution is calculated. For this, we use the following formula:

$$d_i^+ = \sqrt{\sum_{j=1}^{n} (V_{ij} - V_j^+)^2}$$

$$d_i^- = \sqrt{\sum_{j=1}^{n} (V_{ij} - V_j^-)^2}$$

$$CL_i^* = \frac{d_i^-}{d_i^- + d_i^+}$$

The value of CLi is between zero and one. The closer this value is to one, the solution is closer to the ideal solution and is a better solution.

https://doi.org/10.37896/pd93.1/93111

ISSN: 0369-8963

Table 6. Distance from positive and negative ideals

Row	The title of the contract	Distance from positive ideals +di	distance from negative ideals di-	The amount of CLi
1	Franchise contracts	0.136	0.036	0.209
2	Participation in production	0.092	0.049	0.348
3	Buy Back	0.087	0.061	0.412
4	Direct investment or finance	0.084	0.062	0.423
5	Engineering, Procurement and Construction (EPC)	0.047	0.107	0.697
6	Job Based contracts	0.059	0.088	0.597
7	IPC Iran oil contracts	0.069	0.075	0.520
8	Alliance (OPC)	0.036	0.136	0.791

The sixth step - ranking the options

At this stage, based on the results obtained from the TOPSIS fuzzy method, the options are ranked, the results of which are described in the table below.

https://doi.org/10.37896/pd93.1/93111

ISSN: 0369-8963

Table 7. Rating of construction contracts in the field of oil and gas

Row	The title of the contract	rank	CLi value	explanations
1	Franchise contracts	**8**	0.209	
2	Participation in production	**7**	0.348	
3	Buy Back	**6**	0.412	
4	Direct investment or finance	**5**	0.423	
5	Engineering, Procurement and Construction (EPC)	**2**	0.697	
6	Job Based contracts	**3**	0.597	
7	IPC Iran oil contracts	**4**	0.520	
8	Alliance (OPC)	**1**	0.791	

The OPC unification method has a favorable rating for common fields and border areas with Cli=0.791.

https://doi.org/10.37896/pd93.1/93111

ISSN: 0369-8963

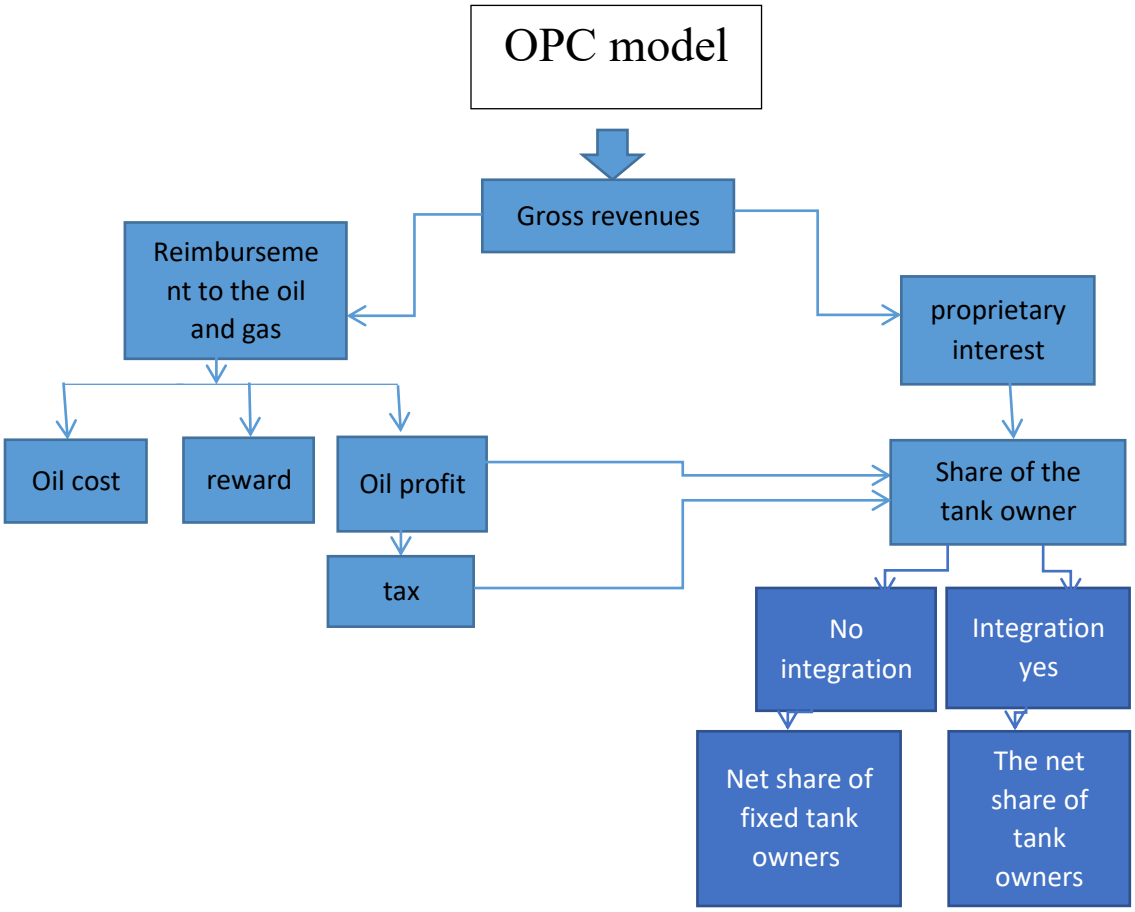


Figure 3. OPC model

Conclusion and comparison of alliance method (OPC model) with other contracts:

After the necessary investigation, using the output of the TOPSIS fuzzy method, it was determined that the alliance model (opc) was favorable for common fields and border areas and in addition to unification of joint oil and gas fields with other countries, the ownership and governance of the field and the protection of oil reservoirs and related data have been observed, transfer of knowledge and technology and reverse engineering and self-sufficiency of the tank owner has been done, the sale of crude oil has been prevented, by converting crude oil into products with high added value and producing knowledge-based products, it creates currency for the tank owner. **By extracting flare gases with oil and using them, it has reduced pollutant emissions and preserved the environment, with the construction of petrochemical industries and petrochemical parks, attention to sustainable development and job creation is well seen.**

Based on the analysis, it was determined that the OPC alliance method contract was suitable for joint fields and in the ranking, in terms of important and influential indicators in the success of construction contracts, as well as protection of the field and preservation of the environment, sustainable development, transfer of knowledge and experience, and other important indicators related to contracts, according to experts, it has a favorable rank with Cli=0.791. In this research, for fields that have been explored and have adequate reserves of oil and gas and joint fields, the worst type of contract was determined by the scoring method with Cli=0.209.

https://doi.org/10.37896/pd93.1/93111

ISSN: 0369-8963

References:

1. Saremi, Mahmoud, Jamali, Ahmad (2003), Application of Fuzzy Multi-Index Decision Making Model to

Select the Appropriate Foreign Investment Method in the Upstream Sector of the Oil Industry of the Islamic Republic of Iran, Quarterly Journal of Business Research, Volume 8, Number 29, pp. 188-167.

https://www.sid.ir/fa/journal/ViewPaper.aspx?id=4075.

2. Ebrahimi, Seyed Nasrollah and Shirijian, Mohammad (2014), Upstream Contracts of the Islamic Republic of Iran and Explaining the Legal Implications and Requirements of New Contracts, Quarterly Journal of

Economics and Energy. Third Year, No. 10, pp. 39-1. https://www.sid.ir/fa/journal/ViewPaper.aspx?id=222807.

3. Zakernia, Ehsan, Khajehzadeh Dezfuli, Mehdi and Fadaei Vahed, Meysam (2016), Prioritization of effective factors on the choice of financing method in Iran using TOPSIS method in a fuzzy environment based on verbal variables, Journal of Financial Engineering and Securities Management, Volume 7, Number 27, Summer 2016, pp. 70-53. https://www.sid.ir/fa/journal/ViewPaper.aspx?id=261501.

4. Qolipour, Hossein; Nasiri Khonsari, Mohammad Mehdi (2016), Using multi-criteria decision-making methods to select the appropriate type of contract for earth, oil and gas projects, Central Library of Pardis 2 Technical Registration Number: 304211; Central Library - Information Hall Registration Number: 77614; Central Library of Technical Campus 2 Registration Number: 304211; Central Library - Information Hall Registration Number: 77614. https://doi.org/3.10841/1.984571

5. Bindemann, K. (1999). Production-sharing agreements: an economic analysis, Oxford Institute for Energy Studies Chicago, 1-93. http://creativecommons.org/licenses/by-nc-sa/4.0/

6. Kayser, D. (2013). Recent research in project finance-a commented bibliography. Procedia Computer Science, 17, 729-736. https://doi.org/10.1016/j.procs.2013.05.094

7. Shen-fa, W., & Xiao-ping, W. (2009). The rule and method of risk allocation in project finance. Procedia Earth and Planetary Science, 1(1), 1757-1763. https://doi.org/10.1016/j.proeps.2009.09.269.

8. Nahrini, Fereydoun., 2014, The nature and effects of contract termination in Iranian law, Ganj-e-Danesh

 https://doi.org/10.37896/pd93.1/93111

9. Hassan Beigi, Abolfazl, Oil, Buyback and National Interests, Avae Noor Publications, Tehran, First Edition

2012.

10. Farshad Gohar, Nasser "A Look at Iranian Oil Contracts" Research Institute of Economic Affairs, Tehran, First Edition, 2016.

11. Alizadeh Tabatabai, Mohammad, 2010, Termination of Contracting Contracts by the Employer in the General Conditions of the Contract, Shahid Beheshti Master Thesis, Law University.

12. Ghahremani, Nader, 1991-71, Government contracts and their unilateral termination, Master's thesis,

University of Tehran.

13. Mohammadzadeh Asl, Hossein, 1998, Arbitration in Iranian Law, Master Thesis, University of Tabriz, Faculty of Law.

14. Ansari, Valiullah, 1998, General Law of Administrative Contracts, Lawyer Publishing.

15. Bazgir, Yadollah, 2002, Selected votes of the Supreme Court in contracts, Ferdowsi Publications.

16. Jafari Langroudi, MJ, 1999, Civil Law Course, Law of Obligations, Ganj-e-Danesh Publications.

17. Kripa E, Xhafa H. (2020). Project finance, and projects in the energy sector in developing countries.

Economics and Finance Review, Vol. 3(01), 1-11. https://doi.org/13.1109/5.771073.

18. Jaffe, A.M. (2019). Iraq's Oil Sector: Issues and Opportunities. The James A. Baker III Institute for Public

Policy of Rice University.

19. Abbasi, Ebrahim and Mostafavi, Seyed Iman (2016), A Study of Project Financing Methods in the Upstream Sector of Iran's Oil Industry, Quarterly Journal of Financial Economics, Volume 10, Number 35, pp. 130-103. https://www.sid.ir/fa/journal/ViewPaper.aspx?id=279649.

20. Momeni Vesalian, Houshang, Ghanimifard, Hojjatollah and Mahmoudi, Mohammad (2009), A comparative study of reciprocal sales contracts and participation in production in upstream projects of Iran's oil and gas industry. Second Year, Volume 2, Number 6, Pages 157-135. https://doi.org/8.2108/5.631254.

ISSN: 0369-8963

21. Jalili, Mohammad, Fallah Shams, Mirfeiz, Seyed Mostafa, Zainuddin and Mohammadiha, Saeed (2010),

Ranking of Foreign Financing Methods for Investing in the Oil Industry of the Islamic Republic of Iran Using

Hierarchical Analysis, Quantitative Studies Quarterly in Management, Volume 1, Number 2, pp. 79-53.

https://doi.org/6.14361/2.287453.

22-Sayari,A. Rahimi, A. and Soltanpanah, H. (2022). Designing a Model of Effective Factors in the Failure of Manufacturing Contracts in the Field of Oil and Gas: Using the AHP Technique. International Journal of Nonlinear Analysis and Aplications.

 https://doi.org/10.37896/pd93.1/93111