Journal of Enviromental Economics & Chemical Processes (JEECP)

Journal of Enviromental Economics & Chemical Processes (JEECP)

journal homepage: *WWW.JEECPJournal.com*

Portfolio Selection of Iranian`s Exploration and Production Companies under Petroleum Investment Fiscal Regimes Using a MADM Model

Fatemeh Farajizadeh[a], Mohammadali Hatefi [a*]

[a] *Department of Energy Economics and Management, Tehran Faculty of Petroleum, Petroleum University of Technology (PUT), Abadan, Iran.*

P A P E R I N F O

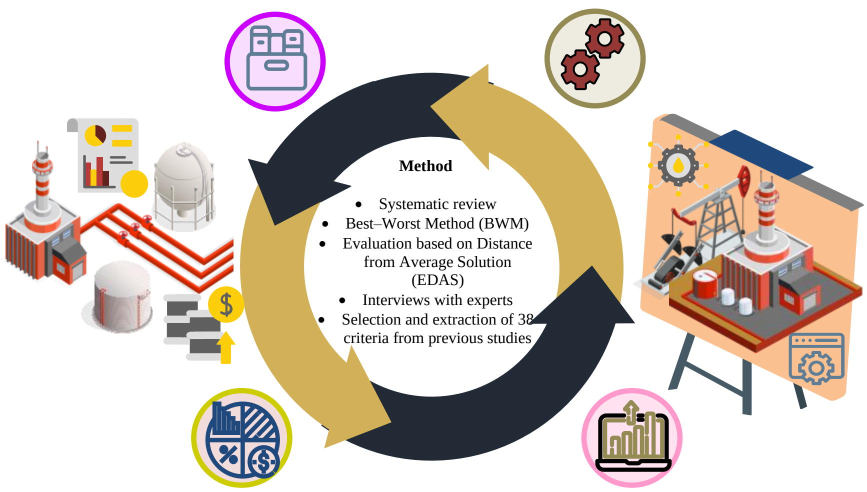
Paper history:
Received 07/10/2024
Accepted in revised form 09/12/2024

Keywords:
Project Portfolio Selection
BWM
EDAS
Oil and Gas Exploration and Production

A B S T R A C T

In Iran, one of the most important challenges is the identification and optimal selection of oil and gas projects and opportunities for related companies, considering financial and technical constraints. This study aims to propose a systematic model for the optimal selection of oil &gas Exploration & Production (E&P) project portfolio based on the characteristics of Iranian companies and the country's financial conditions. initially, a comprehensive literature review was conducted, and 39 project selection criteria were collected from previous studies. After evaluation by Subject-Matter Experts (SME), 38 criteria were selected as suitable for the conditions of Iran's oil and gas industry. Then, the Best-Worst Method (BWM) was used to determine the weights of these criteria, and the top ten criteria with the highest weights were identified. Finally, the Evaluation based on Distance from Average Solution (EDAS) method was applied to prioritize the projects. The results show that this model can serve as a strong tool in the process of managing O&G-E&P-PP. However, the main limitation of this study is its dependence on the country's political and economic conditions, which can significantly affect the criteria weights and final outcomes.

https://doi.org/..



* hatefi@put.ac.ir

URL:

Please cite this article as: : F, Farajizadeh., & M. A, Hatefi., (2024). *Journal of Enviromental Economics & Chemical Processes (JEECP)*, ?(4), ??-??. https://doi.org/10.30501/................

1. Introduction

Nowadays one of the most important issues in Iran is the need for companies that have both the technical and financial capacity to manage the upstream projects and megaprojects of the oil industry, and thus take responsibility for the risky phases of exploration, evaluation and development of the life cycle of an oil or gas field. And one of the most influential decisions have been at the policy level of the ministry of oil, which eventually led to the definition of the issue of Iranian Exploration and Production (E&P) companies[1]. The procedure for determining the qualification of companies for exploration, development and production of oil and gas fields in Iran was announced by bijan zanganeh, former minister of oil, and it was specified that in general terms, the structure and pattern of new upstream oil contracts are predicted in addition to maximum use of the capacities of domestic vendors to supply equipment and goods required for projects and also utilizing the capacities of domestic contractors to implement oil projects and perform operations such as drilling and completing wells at sea and on land, the leverage and the possibility of signing and implementing such contracts to establish and strengthen the country's management and technology capacities to implement large oil projects in the field of E&P to the maximum possible benefit; therefore, the establishment of E&P companies in various clauses of the new terms and pattern of oil contracts has been considered [2]. Finally, it was decided to evaluate these companies in the form of three-level model: the initial model: screening model, the second model: pre-evaluation model and the third model: evaluation model, based on which, the competence and capability of volunteer companies in special working groups is reviewed and the final list is introduced to foreign companies[3]. The call for identification and evaluation of Iranian companies applying for activities in the field of E&P was announced in may 2016, and in mid-july of the same year, after evaluating the companies applying for activities in the field of E&P companies, eight companies were named, identified and introduced as competent Iranian companies in this field. After that, in order to determine a new opportunity to submit and complete the documents of Iranian companies seeking activity in the field of E&P and monitoring and evaluation of the performance of approved Iranian companies, several other qualified companies to the total Iranian companies previously capable of operating in the form of E&P companies were added. Thus, the number of Iranian companies licensed to operate in this field has reached 17 companies [4]. Petropars, Engineering and construction of oil industries, Dana energy, PetroIran development company, Mapna group in oil and gas, Khatam-al anbiya construction headquarters, Indistrial project managemet of Iran (IPMI), Persia oil and industry development co., Ghadir investment co., Pasargad energy development co., Tenco company, Iranian Offshore Engineering and Construction co. (IOEC), Kayson inc., Iran Ofogh Industry Development co. (IOID), Pars petro zagros, Global petro tech kish co., North drilling (Sina energy development Co.) are 17 Iranian E&P companies [5]. Considering the increase in the number of Iranian exploration and development companies in recent years and the need to empower them, and also due to the characteristics of these companies such as lack of capital, lack of new technologies and their low experience in exploration [6], a model is needed to select the optimal portfolio of assets and opportunities for E&P, which in choosing it, takes into account both the characteristics of the company and the financial regimes in the country. Therefore, the question is what model can be provided for Iranian E&P companies to select an optimal portfolio of assets and opportunities for E&P under Iranian financial regimes? The main goal of this study is to form an optimal portfolio of assets and opportunities for E&P according features and growth strategy of Iranian E&P companies under financial regimes in Iran. The purpose of this study is to first identify investment opportunities for E&P in Iran and the world and determine the evaluation criteria of these opportunities from the perspective of Iranian companies operating in this field and then to form an optimal portfolio of assets and opportunities for E&P according features and growth strategy of Iranian E&P companies under financial regimes in Iran. Projects are used by organizations to implement their strategy and changes, increase their competitiveness and presence in the market, production of novel product and services, and generally to satisfy their clients projects, programs, subsidiary portfolios, and operations managed as a group to achieve strategic objectives [7]. Project Portfolio Management (PPM) is the centralized management of one or more portfolios to achieve strategic objectives. It is the application of PPM principles to align the portfolio and its components with the organizational strategy. PPM can also be viewed as a dynamic activity through which an organization invests its resources to achieve its strategic objectives by identifying, categorizing, monitoring, evaluating, integrating, selecting, prioritizing, optimizing, balancing, authorizing, transitioning, controlling, and terminating portfolio components [7]. Unconventional oil resources are oil obtained by using unusual methods compared to oil produced or extracted from ordinary oil wells. Unconventional oil resources include oil shale (sedimentary rocks containing kerogen), oil sand (sand containing bitumen), heavy and super heavy oil (oil with high viscosity and api less than 10 °). Iran, with 32.81 trillion cubic meters of gas reserves (according to the report of the National Iranian Oil Company - NIOC), has a share of 17.58% of the total proven gas reserves in the world. According to opec, Iran has the second largest reserves after russia with 33.72 trillion cubic meters and according to bp statistics with 33.5 reserves (17.96% of the world reserves) and according to bp statistics which include production trend has been published in 2016, the reserve index to gas production for Iran is estimated at about 165.5 years[8]. In every industry, there are various activities that must take place to transform inputs of raw materials, knowledge, labor, and capital into end products purchased by customers. A value chain is a device that helps identify the independent, economically viable segments of an industry [9]. The first concession agreement in the middle east was granted to william darcy by Iran in 1901 [10]. But the host country's lack of share of oil revenues, on the one hand, increased knowledge and skills of oil companies, the establishment of opec, increasing the bargaining power of opec members and the development of the principle of "permanent sovereignty over natural resources" caused developing countries abandon of such agreements. The principle of permanent sovereignty means that countries with natural resources have the right to exercise control over their territorial resources and can exploit these resources in any way they wish. These countries can enact laws and regulations related to the ownership, investment and exploitation of these resources [11]. In other words, after the concession system, the contract system entered the field with the type of production participation contracts and service contracts.production partnership agreements (psas) are one of the most common types of oil development and exploration contracts. Based on government production sharing agreements, the owner of the mineral resources uses a foreign oil company as acontractor to provide technical and financial services for exploration and development operations. Traditionally, the government itself or one of its affiliates, such as the NIOC, becomes a party to the contract. The foreign company is entitled to a certain share of the oil produced as a reward for the risk and services provided. Nevertheless, the government remains the owner of the entire oil reserves and part of the product, provided that it grants the contractor a share of the oil produced [12]. The contractor's extract from the produced oil consists of two parts; first, oil cost that is a percentage of production to offset production costs and exploration to the contractor in case of commercial discovery [13], the second is oil, which after deducting ownership interest, cost oil and residual income tax and is divided according to the contract between the contractor and the state- owned company [14]. Theoretically, participation in the production is a kind of service contract in which the share paid to the oil company is a kind of payment made by the government to the oil company at the point of export [15]. In production participation contracts, from the point of view of the contract itself and domestic law, the foreign company will not have ownership of underground tanks. And only allow the foreign company, with the success of the exploration and extraction operations, to finally withdraw part of the profits from the operations and investments made from the extraction oil and gas from the same contract area [16]. A service contract is a contract in which an oil company receives a fee for the provision of certain services. In other words, in such contracts, the oil company, as a capital contractor, uses its technical and managerial capacity to explore and develop oil fields and receives wages in return [17]. Service contracts, in turn, are divided into two categories: pure service contracts and risk service contracts. The difference between the two categories is that in one payment to the government is fixed (service only) and in the other payments are calculated based on the amount of profit earned (service contracts with risk) [18]. Under risk service contracts, the fee is paid to the foreign company only if there is production. The production phase is associated with "exploration risk". Exploration risk means that the foreign company (depending on the contract, all or part of it) will bear the risk of exploration activities until the stage of commercial discovery and oil production. If there is no commercial discovery of oil (ie. Production), the risk of exploration is realized and the foreign company does not receive anything. On the other hand, purely service contracts guarantee the payment of a fee to a foreign company, regardless of commercial discovery and production [19]. Thus, the difference between service contracts and partnerships is in how the contractor's services are reimbursed in cash or in crude oil. In production Sharing contracts, the contractor receives a share of the oil produced [20]. Reciprocal sales contracts that have been used in the Iranian oil industry for many years are in fact a kind of Iranian service contract and therefore are analyzed for legal analysis within the framework of the same service contracts. Of course, it should be said that the name of this type of contract in the Iranian oil and gas industry is service purchase contract [21]. Therefore, the title of reciprocal sale taken from buy-back is not correct. The reason for classifying reciprocal sale contracts in the category of service purchase contracts is that the repayment of oil costs of these contracts along with its investment profit from oil, gas liquids and petroleum products or its revenues is made and as a result payments to cash or product delivery [22]. Therefore, the reciprocal sale contract is a risky service type, and the risky service contract is not fundamentally different from the participation in production, and its difference is minor and in the financial regime. In other words, in participation in production, payment is in the form of goods, but in risky service contracts, payment is in cash[23]. In a reciprocal sale contract, it recovers its contract costs and fees in the form of a long-term crude oil sales agreement. If commercial production is achieved from the field revenues located in the same area. In other words, according to the general provisions of such contracts, the contractor's studies should be recycled from a percentage of the revenue (gross field) [24]. Now, based on the cases stated in the field of literature, it should be determined what is the appropriate approach of the oil industry innovation system for development based on technological innovation in the upstream sector.factors affecting the selection of appropriate development strategy in the country's oil industry innovation system in this area are:

- Industry targeting (development of new products or services or access to mature technologies)
- Type of technical knowledge required (know-how or know-why)
- Available level of required technical knowledge
- Industry parameters (size of firms, whether small or large, type of industry such as being knowledge-intensive, capital-intensive or ...
- Competitiveness factors: internal factors (including technological, industrial and specialized human resources capabilities); internal demand conditions; related and supporting industries; strategy, structure, competition and government

- The point to consider in the acquisition of many technologies in the oil industry is that due to the maturity of many technologies in this field, the path of technology acquisition has passed through the dui path, but after transferring the production line and manufacturing technology and reaching

2. Method

The first step of the research is providing an initial list of project portfolio selection criteria, obtained from literature review of previous studies. As a result of introduction in previous section, decision criteria were found in oil and gas industry. As a result, a preliminary set of decision criteria was identified and categorized.after collecting all expert`s opinions simple average score for reach criteria will calculated and by sorting them from most to lowest scores, the top 10 criteria will be extracted[25].

The participant for this research is chosen among project portfolio manager, project managers of iranian E&P companies in oil and gas industry. The statistical information of participants is expressed in following table (1).

Table 1. Statistical information of participants

Position	Level of Education	Years of working experience
Project manager (3) Project portfolio manager (6) project manager vicar (3)	Master (8) Doctorate (4)	Less than 5 years (0) 5-10 years (5) 11-15 years (4) More than 15 years (3)

SMES opinions were gathered, the average scores for each criterion were calculated, and then, the criteria which had top ten scores were selected as decision criteria for this study.best-worst method (BWM) was first proposed by jafar rezaei in 2014 to solve mcdm1 problems. It is a pairwise comparison-based method. According to this method, the best and the worst criteria are identified by the decision-maker. Suppose we have n criteria, and we want to compare these criteria in pairs using a ratio of 1/9 to 9. The resulting matrix will be:

$$A = \begin{matrix} & c_1 & c_2 & \cdots & c_n \\ a_1 & p_{11} & p_{12} & \cdots & p_{1n} \\ a_2 & p_{21} & p_{22} & \cdots & p_{2n} \\ \vdots & \vdots & \vdots & \ddots & \vdots \\ a_m & p_{m1} & p_{m2} & \cdots & p_{mn} \end{matrix}$$

Among them, aij represents the relative preference of criteria i to criteria j. Aij = 1 shows that i and j are equally important. Aij > 1 shows that i is more important than j, and aij = 9 shows that i is extremely important to j. Aji shows the importance of j to i. In order to make matrix a reciprocal, it is required that aij = 1 /aji and aii = 1, for all i and j. Consider the reciprocal nature of the matrix a. To obtain the complete matrix a, n (n -1)/2 pairwise comparisons are required. In the following cases, the pairwise comparison matrix a is considered to be completely consistent:

$$\forall\ a_{ik} \times a_{kj} = a_{ij}, \quad \forall\ i,j$$

By running pairwise comparison aij, the decision-maker expresses the direction and strength of the preference i over j. The steps of BWM are described so that can be used to derive the weights of the criteria.

Step 1. Determine a set of decision criteria.[26] In this step, we consider that the criteria { c_1; c_2; ……; c_n }[27] should be used to make a decision.

Step 2. Determine the best (e.g most ideal, most important) and worst (e.g least ideal, least important) criteria 4. In this step, the decision maker generally determines the best and the worst criterion. No comparison is made at this stage.

Step 3. Determine the priority of the best criterion over all other criteria using a number from 1 to 9. The resulting best-to-others vector would be:

$$AB = (a_{B1}, a_{B2}, \dots, a_{Bn}) \quad (1)$$

where abj gives the preference of the best criterion b over criterion j. It is clear that $a_{BB} = 1$.

Step 4. Determine the priority of all criteria over the worst criterion using a number between 1 and 9. The others-to-worst vector result would be:

$$AW = (a_{1W}, a_{2W}, \dots, a_{nW})^T \quad (2)$$

where ajw indicates the preference of criterion j over the worst criterion w. It is clear that $a_{WW} = 1$.

Step 5. Find the optimal weights ($w_1^*, w_2^*, \dots, w_n^*$). The optimal weight for the criteria is the one where, for each pair of w_B/w_j and w_j/w_W, we have $w_B/wj = a_{Bj}$ and $w_j/w_W = a_{jW}$. To satisfy these conditions for all j, we should find a solution where the maximum absolute differences $|w_B / w_j - a_{Bj}|$ and $|w_j / w_W - a_{jw}|$ for all j is minimized. Considering the non-negativity and sum condition for the weights, the following problem is resulted:

$$\text{Min max}_j \{ |w_B / w_j - a_{Bj}|, |w_j / w_W - a_{jW}| \} \quad (3)$$

$$\text{St. } \Sigma_j w_j = 1$$

$$W \geq 0, \text{ for all j}$$

The previous problem can be transferred to the following problem:

$$\text{Min } \xi \quad (4)$$

St.

$$|w_B / w_j - a_{Bj}| \leq \xi, \text{ for all j}$$

$$|w_j / w_W - a_{jW}| \leq \xi, \text{ for all j}$$

$$W \geq 0, \text{ for all j}$$

By solving the problem, the optimal weight ($w_1^*, w_2^*, \dots, w_n^*$) and ξ^* will be obtained. In this section, then, it should be presented as consistency ratio for the BWM.a comparison is completely stable while $a_{bj} \times a_{jw} = a_{bw}$, for all j, in which a_{bj}, a_{jw} and a_{bw} are respectively the preference of the best criterion over the criterion j, the preference criterion j over the worst criterion, and the preference criterion of the best over the worst criterion.however, it is possible for some j not to be fully consistent, which is why we propose a consistency ratio to indicate how consistent a comparison is. We use these maximum values as consistency index. We then calculate the consistency ratio, using ξ^* and the corresponding consistency index, as follows:

$$\text{Consistency Ratio} = \xi^* / \text{Consistency Index} \quad (5)$$

Likert-type scales are frequently employed in research, a psychometric response scale primarily used in questionnaires to obtain participant's preferences or degree of agreement with a statement or set of statements. Table (2) shows 9-points liker scale which transform verbal phrase to number.

Table 2. Points Likert Scale

Verbal phrase	Very low	Very low to low	Low	Low to medium	Medium	Medium to high	High	High to very high	Very high
Verbal Value	1	2	3	4	5	6	7	8	9

The evaluation based on distance from average solution (EDAS) method was introduced by keshavarz ghorabaee, zavadskas, olfat, and turskis in 2015[29-31]. This method is very practical in conditions with the contradictory attributes, and the best alternative is chosen by calculating the distance of each alternative from the optimal value. Further, the input information is determined as the decision matrix, as shown in eq(6).

$$X = \begin{bmatrix} r_{11} & \cdots & r_{1j} & \cdots & r_{1n} \\ \vdots & \ddots & \vdots & \ddots & \vdots \\ r_{i1} & \cdots & r_{ij} & \cdots & r_{in} \\ \vdots & \ddots & \vdots & \ddots & \vdots \\ r_{m1} & \cdots & r_{mj} & \cdots & r_{mn} \end{bmatrix}_{m \times n} ; \quad i = 1, \dots, m, \quad j = 1, \dots, n \quad (6)$$

Where r_{ij} is the element of the decision matrix for i^{th} alternative in j^{th} attribute. In addition, the decision maker provides the weight of attributes [w_1; w_2; ...; w_n].

Eq(7) is used to determine the average solution of each attribute [24].

$$AV_j = \frac{\sum_{i=1}^{m} r_{ij}}{m}; \quad j = 1, \dots, n \quad (7)$$

According to the positive and negative types of attributes, the positive distances from average (PDA) and negative distances from average (NDA) of the positive attributes are calculated by eqs. (8) and (9) respectively [29].

$$PDA_{ij} = \frac{max(0, (r_{ij} - AV_j))}{AV_j}; \quad i = 1, \dots, m, \quad j = 1, \dots, n \quad (8)$$

$$NDA_{ij} = \frac{max(0, (AV_j - r_{ij}))}{AV_j}; \quad i = 1, \dots, m, \quad j = 1, \dots, n \quad (9)$$

In addition, the PDA and NDA values of the negative attributes are determined using eqs. (10) and (11) [29].

$$PDA_{ij} = \frac{max(0, (AV_j - r_{ij}))}{AV_j}; \quad i = 1, \ldots, m, \quad j = 1, \ldots, n \tag{10}$$

$$NDA_{ij} = \frac{max(0, (r_{ij} - AV_j))}{AV_j}; \quad i = 1, \ldots, m, \quad j = 1, \ldots, n \tag{11}$$

Considering the weight of the attributes, eqs. (12) and (13) are used to determine the values of the weighted PDA and weighted NDA of each alternative, respectively[29].

$$SP_i = \sum_{j=1}^{n} PDA_{ij}.w_j; \quad i = 1, \ldots, m \tag{12}$$

$$SN_i = \sum_{j=1}^{n} NDA_{ij}.w_j; \quad i = 1, \ldots, m \tag{13}$$

Eqs. And are used to normalize the values of the weighted PDA and weighted NDA, respectively[29].

$$NSP_i = \frac{SP_i}{\max_i(SP_i)}; \quad i = 1, \ldots, m \tag{14}$$

$$NSN_i = \frac{SN_i}{\max_i(SN_i)}; \quad i = 1, \ldots, m \tag{15}$$

The appraisal score for each alternative is computed as eq. (16) [29].

$$AS_i = \frac{1}{2}(NSP_i + NSN_i); \quad i = 1, \ldots, m \tag{16}$$

For the final ranking of alternatives, the appraisal scores of alternatives are arranged in a descending order and the final ranking is made.

3. Results and discussion

An average score of SMEs opinions is calculated and by descendingly sorting them the top ten criteria were obtained as table (3) shows:

Table 3. The top ten criteria based on SMEs opinions

Criteria code	Criteria	Score
C17	Stability of return on investment	100
C4	Plateau production period	90
C12	Distance from border	90
C16	Costs	90
C18	Foreign financing	90
C7	Subsurface complexity	85
C29	Oilfield development plan	85
C34	Operator track record	85
C6	Known reservoir characteristics	80
C1	Size of reservoir (original oil in place)	80

By following the BWM steps presented in chapter 3, the main criteria will wight.

Table 4. Weight of criteria gained from the BWM

Criteria code	Criteria	Weight
C17	Stability of return on investment	0.0241
C4	Plateau production period	0.2249
C12	Distance from border	0.0412
C16	Costs	0.0582
C18	Foreign financing	0.1168
C7	Subsurface complexity	0.0872
C29	Oilfield development plan	0.2730
C34	Operator track record	0.0675
C6	Known reservoir characteristics	0.0590
C1	Size of reservoir (original oil in place)	0.0476

The consistency ratio which indicates how consistent a comparison is as follows:

$$\frac{Consistency\ Ratio}{0.05605}$$

In order to evaluate and prioritize projects based on the decision criteria obtained from previous steps, the EDAS method is applied.
The weights of criteria were found through BWM and presented in table (4). Nature of each criterion is as shown in table (5).

Table 5. Nature of each criterion

Criteria code	Criteria	Weight
C17	Stability of return on investment	Positive
C4	Plateau production period	Positive
C12	Distance from border	Negative
C16	Costs	Negative
C18	Foreign financing	Positive
C7	Subsurface complexity	Negative
C29	Oilfield development plan	Positive
C34	Operator track record	Positive
C6	Known reservoir characteristics	Positive
C1	Size of reservoir (original oil in place)	Positive

To determine the average solution of each attribute eq. (10) is used. Result is shown in table (6).
Based on the result achieved from the EDAS method, project 3 is better than project 7 better than project 4 better than project 1 better than project 2 better than project 5 better than project 6.
Cronbach's alpha of EDAS questionnaire is 0.7528.
This section contains the process of identifying project portfolio selection criteria, screening them to find major decision-making criteria, determining the weight of each criterion, ranking projects based on them were presented and as a result priority of projects in order to establish a project portfolio of E&P opportunities and assets is found.

Table 6. The average solution of each attribute

	Size Of Reservoir	Plateau Production period	Known reservoir characteristics	Subsurface complexity	Distance From border	Costs	Stability of return On investment	ForeignFinancing	Oilfield Development Plan	Operator Track Record
P1	2.9676	4.0479	1.9719	1.9719	1.9252	4.0712	4.0932	3.0396	1.9913	1.9913
P2	5.9439	3.9613	4.9676	1.9719	7.3432	5.2844	3.4119	2.9836	3.4947	5.2828
P3	4.5009	1.9252	5.9439	3.1441	3.6271	2.9417	5.5292	6.5379	3.8427	5.0349
P4	6.2505	5.0900	4.4180	4.3707	5.7796	4.6807	3.9962	3.9360	2.0396	6.5002
P5	6.7715	2.8439	5.1019	3.8427	4.8320	5.3205	3.2521	4.8580	2.9130	5.1977
P6	3.9883	2.5089	3.9360	2.9417	4.1700	5.9136	3.3820	3.6663	2.0891	6.1563
P7	7.0445	4.9492	6.0001	4.0851	5.4566	4.5591	4.3514	2.8845	3.9360	5.9579
Avg	5.3525	3.6181	4.6199	3.1897	4.7334	4.6816	4.0023	3.9866	2.9009	5.1602

Table 7. Positive distances from average (PDA)

	Size of reservoir	Plateau production period	Known reservoir characteristics	Subsurface complexity	Distance from border	Costs	Stability of return on investment	Foreign financing	Oilfield development plan	Operator track record
P1	0.0000	0.1188	0.0000	0.3818	0.5933	0.1304	0.0227	0.0000	0.0000	0.0000
P2	0.1105	0.0949	0.0752	0.3818	0.0000	0.0000	0.0000	0.0000	0.2047	0.0238
P3	0.0000	0.0000	0.2866	0.0143	0.2337	0.3716	0.3815	0.6400	0.3247	0.0000
P4	0.1678	0.4068	0.0000	0.0000	0.0000	0.0002	0.0000	0.0000	0.0000	0.2597
P5	0.2651	0.0000	0.1043	0.0000	0.0000	0.0000	0.0000	0.2186	0.0041	0.0073
P6	0.0000	0.0000	0.0000	0.0778	0.1190	0.0000	0.0000	0.0000	0.0000	0.1930
P7	0.3161	0.3679	0.2988	0.0000	0.0000	0.0262	0.0872	0.0000	0.3568	0.1546
Avg	0.0000	0.1188	0.0000	0.3818	0.5933	0.1304	0.0227	0.0000	0.0000	0.0000

Next, the PDA and NDA values of the negative attributes are determined using eqs. (10) and (11).

Table8. Negative distances from average (NDA)

	Size of reservoir	Plateau production period	Known reservoir characteristics	Subsurface complexity	Distance from border	Costs	Stability of return on investment	Foreign financing	Oilfield development plan	Operator track record
P1	0.4456	0.0000	0.5732	0.0000	0.0000	0.0000	0.0000	0.2375	0.3136	0.6141
P2	0.0000	0.0000	0.0000	0.0000	0.5514	0.1288	0.1475	0.2516	0.0000	0.0000
P3	0.1591	0.4679	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0243
P4	0.0000	0.0000	0.0437	0.3702	0.2210	0.0000	0.0015	0.0127	0.2969	0.0000
P5	0.0000	0.2140	0.0000	0.2047	0.0208	0.1365	0.1874	0.0000	0.0000	0.0000
P6	0.2549	0.3066	0.1480	0.0000	0.0000	0.2632	0.1550	0.0803	0.2798	0.0000
P7	0.0000	0.0000	0.0000	0.2807	0.1528	0.0000	0.0000	0.2764	0.0000	0.0000
Avg	0.4456	0.0000	0.5732	0.0000	0.0000	0.0000	0.0000	0.2375	0.3136	0.6141

Results of the EDAS method is presented in table (9).

Table 9. Results of the EDAS method

	Spi	Sni	Nspi	Nsni	Asi	Rank
P1	0.1359	0.0982	0.5685	0.4169	0.4927	4
P2	0.0626	0.1329	0.2618	0.2109	0.2364	5
P3	0.2390	0.1103	1.0000	0.3455	0.6728	1
P4	0.1080	0.0680	0.4518	0.5963	0.5241	3
P5	0.0261	0.1256	0.1090	0.2546	0.1818	6
P6	0.0276	0.1685	0.1156	0.0000	0.0578	7
P7	0.1573	0.0529	0.6582	0.6862	0.6722	2

4. Conclusions

By a comprehensive literature review in upstream oil and gas sector in introduction, it is found that there is a lack of research in the field of E&P portfolio of iran`s assets and opportunities. So, in this research, first the concepts of project, portfolio, portfolio management are reviewed. As an output of introduction, 39 project selection criteria which were divided to reservoir, location, economics, socio-economics, market considerations, contracting arrangements, environmental considerations, management and political consideration groups were gathered from previous researches. Next, the criteria were investigated by SMES. Finally, 38 project portfolio selection criteria appropriate to the conditions of iran's upstream oil and gas industry were presented.forming an optimal portfolio of assets and opportunities for E&P according to the characteristics and growth strategy of iranian E&P companies under the existing financial regimes in iran.after identifying final list of project selection criteria, in order to select projects for entry to the portfolio based on the decision criteria, the BWM is employed to measure the weight of each criterion. Then, top ten criteria with highest weights are determined. Next, projects are prioritized based on the EDAS method.in order to selecting a project portfolio in oil and gas knowledge-based organization, practitioners can effectively utilize this method in the process of selecting pp, in order to, thereby supporting other decision-making during portfolio management. Using this method allows consultant companies to compare projects much faster and more accurate. The research is limited to criteria which is affect portfolio selection in iranian`s E&P companies, which accordingly may limit applicability of study for other kinds of organization in oil and gas industry of iran. The proposed model is validated based on the criteria which are based on upstream sector of the iran oil and gas industry. Thus, due to the different environments and contexts, generalizing the findings to other countries may be different.establishing weight factors of criteria was conducted by SMES. Despite the applied process is robust from a research perspective, the outcome is very dependent on the political situation of the country. If the international oil companies return to iran the other criteria such as operator or non-operator may get higher weight and become one of the most important criteria which affect portfolio selection in upstream oil and gas.the proposed model is validated based on the criteria which are based on upstream sector of the iran oil and gas industry. Thus, due to the different environments and contexts, generalizing the findings to other countries may be different.establishing weight factors of criteria was conducted by SMES. Despite the applied process is robust from a research perspective, the outcome is very dependent on the political situation of the country. If the international oil companies return to iran the other criteria such as operator or non-operator may get higher weight and become one of the most important criteria which affect portfolio selection in upstream oil and gas.

Reference

[1] M. Javadi. *Scientific Journal of Petroleum Geomechanics*, 2018,**2(1),** 1-17.
[2] P.Torabi. iranian student`s news agency. 2019 april 15.
[3] H.Movahed. en.shana.ir/news/270480/. 2016 may 17.
[4] Network, p.e.i. The foresight of the ministry of oil paid off. 2018 april 9.
[5] K.Fatahi, in industry news. 2016 july 21.
[6] Pmi, Project Management Institute, pmi.2021, 31.
[7] G.King. pennstate college of erth and mineral sciences.
[8] N.Ely. proceedings of the iba seminar on world energy laws held in stavanger, norway. 1975,21.
[9] R.Kemper. Legal and institutional arrangements, 1982. 29.
[10]G.Zhiguo. Kluwer Law International, ISBN: 9781859661031، 1859661033, 1994.
[11]J. E .Attwell. (1979). Hous. L. REv. 1015, 17.
[12]L.T.Wells. London: euromoney publications, 1986. Pp. 431. $145;£ 98. American journal of international.
[13]F.Iranpour. Law quarterly, journal of the faculty of law and political science, 2008. 38: 25-38.
[14]K.Bindemann. oxford institute for energy studies.1999.23.
[15]A.K.Najafabadi. Institute of studies and research legal knowledge cit., 2014.
[16]M.A.Mian. pennwell books, llc. 2011.
[17]D.Johnston. PennWell Books. 2007.
[18]M.A .Mazeel. diplom. De. 2014.
[19]A.Sahranavard. legal research in the city of knowledge. 2003.
[20]A. Milanizadeh. design and construction contracts. 2007.
[21]B.Taverne. kluwer law international.1996.
[22]S.N Ebrahimi. Iranian journal of energy economics,2014. 3(10):252.
[23]A.Hatami & E. Karimian. Tisa,ed. 2015. 1174.
[24]A. Shiravi. oil and gas rights. mizan law institute ,2014.
[25]M.Saunders: springer science & business media. pearson education.162. 2011
[26]N.Bret-Rouzaut & J.P.Favennec, editions technip.2011.
[27]M.Keshavarz Ghorabaee. Informatica, 2015. 26(3): 435-451.
[28]M.K . Ghorabaee.Journal of air transport management, 2017. 63:45-60.
[29]X.Peng. & C.Liu, Journal of intelligent & fuzzy systems, 2017. 32(1): 955-968.
[30]Z.Turskis & z.Morkunaite & v. A.Kutut. International journal of strategic property management, 2017. 21(3): 318-329.
[31]A.Alinezhad. & J. Khalili. International Series in Operations Research & Management *Science*. 2019.Vol **277**:20 springer.