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Identifying and prioritizing foreign companies interested in participating in post-sanctions Iranian energy sector

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ABSTRACT

Ever since the sanctions on economic and financial cooperation with Iran have been lifted, leading contractors in the field of energy have expressed their interest in participating in Iran's energy sector. This study sought to propose a model for assessing and ranking foreign companies willing to take an active part in the Iranian petrochemical industry. To accomplish this, an integrated model composed of Best-Worst Method, ELECTRE III and PROMETHEE II was proposed. More specifically, to weight the criteria, Best-Worst Method was used, and to evaluate and rank them, ELECTRE and PROMETHEE methods were utilized. The data were gathered through questionnaires which collected the opinions of 8 experts in the field of the Iranian petrochemical industry. Results of data analysis revealed that in final evaluation, some well-known European companies in this area had higher positions compared to the others and those which cooperated with Iran during the sanctions.

1. Introduction

To increase the capacity of petrochemical productions, Iran has to cooperate with foreign companies and attract capital in the form of contracts. Such cooperative activities could help the country overcome the setbacks it experienced over the past decade as a result of the sanctions. Experts believe that Iran, with its newly discovered oil/gas fields, is presently the second oil-rich country in the world (following Saudi Arabia), and the second country with largest gas reservoirs (after Russia). Considering these specifications, Iran can attract a huge amount of capital for its petrochemical activities.

The exceptional opportunities in the Iranian petrochemical industry have attracted the attention of foreign, especially European, investors. Massive gas reservoirs and numerous feeds, accessibility of water resources in southern coats, and the proximity of nautical transport routes are some of the advantages that highlight the unique capacities of the Iranian petrochemical industry for attracting investments.

According to the CEO of the National Iranian Petrochemical Company (NIPC), the industry is currently considered as the foundation of the Iran's economic development and is connected to all branches of the industry. Directing capital toward production could lead to a major transformation in the petrochemical industry. Yet, achieving this goal would not be possible through interior investment; relying on foreign investment appears to be an undeniable necessity, as the industry in question consumes large amounts of capital and demands technology.

The reason why the industry demands huge amounts of capital is that even with 100–200 million dollars, it is not possible to establish a petrochemical unit. The smallest petrochemical unit demands at least 500 million dollars, which is a momentary resource that Iranian investors could hardly afford. and even if exist, they would not be willing to invest resources in a large-scale project; as a result, it is important to pave the way for foreign investors to enter the industry.

The continuous negotiations between Iran and the P5 + 1 (The five permanent members of the United Nations Security Council including China, France, Russia, United Kingdom, United States plus Germany), in an attempt to reach a comprehensive agreement over the Iranian nuclear program, resulted in the Joint Comprehensive Plan of Action (JCPOA) in July 2015. As stipulated in JCPOA, all European multilateral and American unilateral sanctions were lifted against Iran's finance, economy, banking, insurance, investment and all their related services in different industries, including oil, gas, and petroleum, will be instantly canceled.

As the sanctions were terminated, many foreign companies started to express their interest in participating in the projects implemented by the Iranian petroleum sector. The purpose of this study is to propose a model that can evaluate and rank these foreign companies. On this account, this study evaluates and ranks the status of 20 leading petrochemical contractors, based on the criteria extracted from the literature and experts' screened opinions.

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2. Literature review

Because this study seeks to propose a model for assessing and ranking foreign contractors interested in cooperating in the petrochemical industry of Iran, the notions addressed in this section are exclusively concerned with contractor evaluation and selection. Due to the complexity of the evaluation issue and characteristics such as nonlinear relations between contractors, the existence of qualitative and quantitative criteria, topic-based judgment of decision makers, inherent risks and so on, researchers have formulated different models in this regard. Statistical models, multi-criteria decision-making (MCDM), Fuzzy theory, risk analysis, knowledge-based expert systems, and so on, are some of the models which have been proposed to evaluate and rank contractors.

Chau et al. [8] relied on statistical models to make decisions about contractor selection. Holt [19] used multiple regression to select contractors. Skitmore and Marsden [49] in their research applied multivariable discriminant analysis. Multi-criteria analysis is another technique used to choose contractors and evaluate tenders offered [14,64]. Among MCDM models, the analytic hierarchy process (AHP) is one of the major methods that can evaluate contractors' prequalification [3]. AHP has brought about a new insight into decision-making problems, as it relies on pairwise comparisons to conveniently determine the weights of the criteria, in the light of goals set [63].

The fuzzy set theory can convert various levels of contactors' experiences into linguistic variables, such as “Poor”, “Good”, “Highly Experienced.” Therefore, levels of experience can be subjected to meticulous measurement. Probabilistic models can appropriately connect human concepts with probable/subjective judgments. Therefore, fuzzy sets have been effectively used to solve contractor qualification problems [54,60]. Plebankiewicz [35] has proposed a two-phase model for determining contractor prequalification, relying on fuzzy sets for evaluating each project.

Because the fuzzy set theory takes into account the incompleteness of information and the uncertainty of the decision environment through qualitative criteria, the theory has been incorporated into decision-making tools such as AHP, TOPSIS, and QFD to solve contractor qualification problems [13,22,31,62]. Padhi and Mohapatra [32] relied on a fuzzy binary goal programming model to solve the multi-criteria problem of contractor evaluation and selection in India. Pasquire & Collins [34] used a simplified version of contractor evaluation in a study concerned with the impacts of comparative tendering on contractor evaluation. Dimensional weighting and aggregate are among the methods utilized to evaluate contractor prequalification [41,42]. Holt [18] applied cluster analysis for evaluating and ranking contractors. Using risk analysis, Jaselskis and Russell [21] performed contractor evaluation and selection. Performance evaluation system and general Performance model have also been used in evaluating contractors [1,24].

Case-specific argumentation models, as an AI technology, have been drawn on for contractor prequalification [30]. Such models apply solutions suggested for previous problems and adapt them to newly observed problems. Sonmez et al. [52] proposed an evidential argumentative approach to problem-solving. Neural network models, SVM models, and MKL models are among the other analytic systems suggested for contractor prequalification [23,25]. Relying on a genetic algorithm, Xie [61] dealt with contractor selection and evaluation. Awad and Fayek [4] utilized expert systems and support systems in selecting and evaluating contractors.

Graph theory proposes a methodology for solving contractor prequalification problems. Darvish et al. [11]. drew on a matrix method and graph theory for making decisions about contractor selection, applying their proposed method in a case study. Following that, they compared their observations with the findings obtained from simple additive weighting (SAW). Table 1 lists some of the research papers that have dealt with contractor evaluation and ranking, along with the models used in the papers.

Best-Worst Method (BWM) is a multi-criteria decision-making method developed by Rezaei [38]. BWM can be used in various decision-making areas such as business and economics, IT and engineering (see Table 2(. In principle, wherever the aim is to rank and select an alternative among a set of alternatives, Best-Worst Method (BWM) can be used. It can be used by one decision-maker or a group of decision-makers.

This study is aimed to evaluate the companies given the different criteria desired for Iran, and the issue seems to be a necessary in post-sanction. Other studies focus on Iran's economic crisis under sanctions, which especially affected economic institutions like banks, and then, address economic challenges and opportunities facing Iran in the post-sanctions era [12,26,29]. The authors believe that the JCPOA deal is a turning point in the Iran's politics and foreign relations which can create economic and political opportunities. But in this study, the most important opportunity for Iran's economy during the post-sanction period, which is cooperation with major contractors in the field of energy, has been specifically examined, and these companies are prioritized for presence in Iran. This prioritization can help Iranian senior petrochemical industry managers to decide on choosing the final companies to cooperate.

3. Research method

This study was an applied cross-sectional research. The research strategy was quantitative and data were collected through field-studies and library documents. The population under investigation included foreign companies interested in cooperating with the post-sanctions Iran in its petrochemical projects. However, as these companies were not readily available to the researchers, to evaluate and rank them, experts' opinions were resorted to. Various methods in the literature suggested different sample sizes for interviews with experts. Because it would be difficult to manage a sample including more than 8 experts, this study conducted the interviews with 8 experts; this option made it possible to specifically address a variety of complicated issues through the interviews [5]. The experts interviewed and their comments used in this study are currently working at the National Iranian petrochemical Company in the following units. These experts are selected for interviewing because they are involved in deciding to cooperate with foreign companies.

1. Investment & business development directorate
2. Management development center of petroleum industry
3. Legal affairs directorate
4. Research & technology directorate
5. International affairs directorate
6. Financial affairs directorate
7. Oil & gas production coordination and supervision directorate
8. Corporate planning directorate

Data analysis methods are Best-Worst Method to determine the weight of criteria, and also ELECTRE III and PROMETHEE II methods to rank the companies. These methods are introduced in next sections. Fig. 1 illustrates the stages of this research.

3.1. Best-Worst Method

In an MCDM problem, a number of alternatives are evaluated with respect to a number of criteria in order to select the best alternative(s). According to BWM, the best (e.g. most desirable, most important) and the worst (e.g. least desirable, least important) criteria are identified first by the decision-maker. Pairwise comparisons are then conducted between each of these two criteria (best and worst) and the other criteria. A minimax problem is then formulated and solved to determine the weights of different criteria. The weights of the alternatives with