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COMBINING THE SUITABILITY-FEASIBILITY-ACCEPTABILITY (SFA) STRATEGY WITH THE MCDM APPROACH

Sarfaraz Hashemkhani Zolfani[1], Ramin Bazrafshan[2], Parnian Akaberi[2], Morteza Yazdani[3], Fatih Ecer[4]

[1]School of Engineering, Catholic University of the North, Larrondo, Coquimbo, Chile
[2]Department of Industrial Engineering and Management Systems, Amirkabir University of Technology (Tehran Polytechnic), Tehran, Iran
[3]ESIC University, Madrid, Spain
[4]Department of Business Administration, Afyon Kocatepe University, Afyonkarahisar, Turkey

Abstract*. Suitability-Feasibility-Acceptability (SFA) is a fundamental tool for the development and selection of strategy. Any type of decision-making problem can be resolved by Multiple Criteria Decision Making (MCDM) methods. In this research, we explore the complexity of determining the proper goal market for the Chilean fish market. This study proposed a combined approach of SFA with MCDM methods in a real case study. The proposed structure helps to assign the best market for Chilean export fish to West Asia. Three countries (Saudi Arabia, the United Arab Emirates, and Oman) are selected as a target market in this region, and then related criteria are obtained from various sources. In order to develop a new market for the Chilean fishery industry, five major criteria, including the potential of a target market, region's economic attractiveness, consumption of the seafood, location, cost of transportation, and country risks, were selected based on the SFA framework. Calculating the criteria weights is performed by the Best-Worst (BWM) method, and ordering the alternatives is operated by Measurement Alternatives and Ranking according to compromise Solution (MARCOS) methods. The results showed that Oman is the best destination (importer) for the Chilean fish market (Salmon fish as the case).*

Key Words*: International Markets, Multiple Criteria Decision Making (MCDM), Suitability-Feasibility-Acceptability (SFA) Method, Export*

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Corresponding author: Morteza Yazdani
ESIC University, Cam. Valdenigriales, S/N, 28223 Pozuelo de Alarcón, Madrid, Spain
E-mail: morteza.yazdani@esic.university

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1. INTRODUCTION

In recent years, worldwide, some concepts such as globalization, fast technological changes, the appearance of new markets, and changing customer expectations cause fierce emerging competition. This phenomenon forced stakeholders to think strategically and make strategic plans for their business [1]. Strategic planning is the art of creating strategies and aligning a business's vision for the future of industries or markets. In order to select the proper strategy, many strategic options should be surveyed. The strategic planning process usually consists of three critical steps [2]: (i) strategy formulation, (ii) strategy implementation, and (iii) strategy evaluation. In strategy formulation, managers survey markets and make decisions that concentrate on their plan or generally ignore it. By choosing suitable strategies or plans, the company implements them in order to achieve the desired results. In the final step, the performance of the selected strategy is evaluated. In addition to the strategic planning process, some tools are introduced to analyze strategic possibilities. Strategic analysis is a process of seeking the operating environment of a company to formulate a strategy. This analysis consists of three main factors [3]: (i) Identification and evaluation of data relevant to strategy formulation, (ii) analyzing the internal and external environments, and (iii) use of the analytic method. There are various analytic methods in literature like SWOT analysis, PEST analysis, Porter's five forces analysis, four corner's analysis, value chain analysis, early warning scans, war gaming. These methods are used in various fields. Lee et al. used SWOT analysis to measure the limitations and strengths of the Korean space and satellite industry. Sometimes researchers combined them with other methods [4]. Sahani combined SWOT with the MCDM method like AHP and Fuzzy_AHP to formulate and prioritize ecotourism strategies in Western Himalaya, India [5]. Johnson et al. developed a matrix named SFA to evaluate and analyze the strategies [6]. This method consists of three main sections such as suitability, feasibility, and acceptability. The criteria that the managers take into consideration for comparison purposes should categorize in these three sections. The strategies are listed as options in this method, and each criterion gets scores basis on the experts' or managers' verdict. Then, the options are compared by these scores. The SFA covers a varied range of criteria and items. This is an excellent characteristic that helps the managers to compare the strategies from various aspects. However, this is a plausible method but has some constraints for real problems or complicated issues. It has not a distinct method for assigning a weight of criteria. This is one of the problems that make the managers less ready to use this analytic method.

The SFA method structure is very similar to the MCDM methods, both of them distinguish the priorities of alternatives by evaluating the criteria. This similarity caused the researchers to decide to utilize the MCDM methods, assign weight to criteria, and evaluate the strategies' options. The SFA strategy first selects some criteria and then evaluates them, most likely the MCDM methods. This study attempts to combine the SFA framework with the MCDM methods. Showing the efficiency of this combined methodology, the researchers propose a practical case study and implement this new method on it.

Section 2 reviews literature about SFA and MCDM methods and explains this study's objective. Section 3 describes the methodology of the SFA and MCDM methods. Section 4 addresses the application of this method to exporting Chilean fish and its implementation as well as the research gap and discussion. Finally, section 5 provides conclusions.

2. LITERATURE REVIEW

2.1. A summary of SFA background

Nowadays, using MCDM methods in strategic planning is vital because these methods can be combined with the strategic method and can promote their outcome and accuracy. The MCDM methods with mathematical formulation could help the managers to select the optimum option or the best strategy with the highest degree of satisfaction in the board of managers [7]. In the following, several works that used the MCDM methods in the strategic fields are mentioned. Mehrjerdi used the MCDM method for selecting the strategic system with linguistic preference and gray information. They proposed a method for selecting alternatives in the presence of uncertainty and determined optimal choice among seven possible alternatives. They compared the obtained results with quantitative strategic planning matrix (QSPM), Technique for Order of Preference by Similarity to Ideal Solution (TOPSIS), and simple additive weighting (SAW) methods and gathered a similar ranking with TOPSIS and SAW. Their results also validate that the ranking obtained by the QSPM is inferior in the comparison methods [8]. Selecting an appropriate vendor is often a non-trivial task, in which multiple criteria need to be carefully examined. However, many decision-makers or experts select vendors based on their experience and intuition. Shyur and Shih used a hybrid MCDM model for strategic vendor selection. They proposed a five-step hybrid process, which incorporates an analytic network process (ANP) technique. More clearly, the ANP method is used to obtain the relative weights of criteria. Then, the modified TOPSIS is adopted to rank competing products in terms of their overall performance. They reported that the proposed method is practical for ranking competing vendors regarding their overall performance concerning multiple interdependence criteria. They declared that the consideration of relationships between criteria provides the organization with a way to devise and refine adequate criteria and alleviate the risk of selecting sub-optimal solutions [9]. Banihabib et al. examined the strategies to tackle water shortage for sustainable development in Shahrood, Iran. In their paper, a contentious plan has been proposed to transfer water from the Caspian Sea north of Iran to this region. They used Strengths, Weaknesses, Opportunities, and Threats (SWOT) analysis. Due to the SWOT model's inability to rank the alternatives, the developed strategies are ranked using MCDM models based on specified sustainable development criteria. The ranking model was programmed by using the compensatory models of SAW and analytical hierarchy process (AHP) and the non-compensatory model of Elimination and Choice Translating Reality III (ELECTRE III). All MCDM models' results introduced water transfer as the worst strategy for a region [10]. Hashemkhani Zolfani et al. presented a new strategic hybrid model for international market selection based on Market Attractiveness and Business Attractiveness (MABA) analysis and the EDAS method (one of the latest MCDM methods). They worked on a case in Iran's food industry and could develop the primary model of the MABA analysis in the MCDM outline. Using this model leads to selecting the most suitable and profitable market, considering several quantitative and qualitative factors [11]. As noted, one essential strategic planning, which has three assessment criteria, is the SFA strategy. It has been utilized as a powerful marketing method since the researchers received valuable strategic planning results while using that in a real problem. The following paragraphs review some research projects which used SFA in their studies. In order to get incremental improvement, companies and organizations try to attain an effective strategy. Georgise & Mindaye examined the suitability, acceptability, and feasibility of Kaizen – A Japanese concept used for continuous improvement- among SMEs in Ethiopia. Since organizations were eager to use this strategy, the researchers decided to evaluate Kaizen's feasibility, suitability, and acceptability for these organizations. The study results showed that although some enterprises think it is a confusing strategy, most of them are willing to implement Kaizen in their companies (acceptability). The study also found that the feasibility of Kaizen practices is possible, despite being a bit challenging. As a result, the study showed that Kaizen as an effective strategy is accepted in Southern Region, Ethiopia organizations and can improve their performance. However, still, its feasibility seems challenging [12]. Čirjevskis & Novikova investigated the commercial viability of green energy business to make an investment choice for Latvian hydropower producer and seller LLC "Green Energy Solutions". They investigated the theoretical and practical application of such concept of the commercial viability of a strategy as an SFA, explored the latest trends of Green Energy Business in EU and Latvia, and defined strategic suitability. The research team calculated equivalent annual annuities of each alternative investment project and discussed financial feasibility to confirm disproving investments in a hydropower station or wind turbine [13].

Alimardani et al. presented a new-hybrid strategic model based on the SWARA method and Yin-Yang balance theory to design products with both international and local perspectives [14]. Dalic et al presented a new hybrid MCDM model applied in SWOT strategic tool for decision-making in a transportation company. They applied Fuzzy PIPRECIA, FUCOM, SWOT, and MARCOS methods in their study [15]. Amoozad Mehrjerdi et al. presented a hybrid MCDM model based on BWM and interval-valued intuitionistic fuzzy TODIM for evaluating strategies for implementing industry 4.0 [16]. Ullah et al. reviewed tourism resources in ecologically sensitive coastal areas of Baluchistan to assess their potential for establishing community-based ecotourism following the SFA framework. The collected information about the coastal regions was analyzed through SWOT analysis and fuzzy logic analysis. The results showed that the introduction of CBE within the selected localities without any investment in basic infrastructure and capacity building of communities would inevitably negatively impact the natural environment because the infrastructure and communities' knowledge for developing the desired services were below the required standards [17]. Puška et al. used multi-criteria analysis methods for ranking project management programs. They perform the MARCOS method for evaluating. Since there are many software solutions for the project manager, selecting the best one is critical. So, the researchers choose four softwares: Smart sheet, Asana, Microsoft Project, and Basecamp. They evaluate them by seven scenarios and conclude that the Smart sheet is the best [18]. Pamučar & Savin choose the off-road vehicle for transportation activities in the Serbian Armed Forces because selecting the proper vehicle increases the safety, quality, and efficiency of load carried out. They used the hybrid method BWM-COPRAS for this selection. Seven criteria are introduced by them with each of them having seven sub-criteria. For verification of the results, they used BWM-MABAC and BWM-MARCA models [19]. Hashemkhani Zolfani et al. have proposed a vision-based weighting system (VIEWS) for the managers to consider time vision in their decision-making. They used a hybrid method EDAS-PMADM for this study. The three-time concept is analyzed (Current, 2025, and 2030) and shows that the ranking of alternatives is changed by time. The policymakers by this method can make good decisions for the future of their company [20]. Hasheminasab et al. implement the Circular Economic (CE) for minimizing the harmful effect of using fossil fuel. They consider three different fossil fuels (oil, gas, and coil) for selecting the most sustainable fuels. The EXTENDED-SWARA method is used for evaluating the CE criteria. Then they used the

MARCOS method for ranking, and they showed that gas is the most sustainable fuel of the two others [21]. Hashemkhani Zolfani, et al. developed a novel integrated decision-making tool for selecting the most profitable market. They consider multiple factors like: social, political, economic, and ecological. The hybrid model of Market Attractiveness and Business Attractiveness (MABA) with EDAS proposed and evaluated several international markets by this method [11]. Behzad et al studied the waste management system. They introduced seven criteria: waste generation, composting waste, recycling waste, and landfilling waste, recycling rate, waste to the energy rate, and greenhouse gas emissions from waste. They used the hybrid method BWM-EDAS for weighting and evaluating the criteria and ranking them. The five countries are considered as alternatives: Denmark, Finland, Iceland, Norway, and Sweden. The result showed that Sweden has the best waste management profile (0.9748) [22]. Hashemi et al. used the MCDM method for feature selection. They applied the TOPSIS method for evaluating multi-label data. The ridge regression algorithm is used for constructing a decision matrix; for calculating the weight of this matrix, they implement the entropy method. They ranked the features and said the user could select a desired number of features [23]. Table 1 represents some recent studies about the SFA strategy mentioned above.

Table 1 Studies related to SFA strategy

	Goal	Author/s
1	Evaluating Kaizen strategy usage among SMEs	Bete Georgise & Mindaye [12]
2	Evaluating strategic options of KAIZEN (a business management concept)	Bwemelo [10]
3	Assessing community-based ecotourism potentials of coastal areas of Baluchistan	Ullah et al. [17]
4	Evaluating the potential success or failure of a project	Abu Hassan & Moshdzir [24]
5	Making an investment choice for corporations	Čirjevskis & Novikova [13]

According to the above research, it has been recognized that the SFA is a valuable and productive method. The scientist and stakeholder intend to use it more than before if the degree of conformity is improved. Combining the MCDM method with strategic planning gives a significant result. Therefore, this study tries to boost the accuracy of the SFA by using an MCDM method. In general, the research question concerns the main benefits of combining the MCDM approach in the SFA concept to improve strategy development.

2.2. Research objective and novelty

According to the research question, below are the main aims to reach:

- Improve the SFA strategy for complex problems and increase its accuracy. The SFA is used just for nominal value criteria, but this combination could use the criteria with no nominal value, and,
- Calculate the weight of criteria by a distinct method.

The SFA method allocates criteria weights based on their importance. In other words, the more critical the criterion is, the more amount of weight it will be given during evaluations. However, this method has not introduced a specified way of calculating weights.

Section 3 explains the SFA strategy and the MCDM method, which is used in this strategy. In Section 4, a case study is analyzed with these new criteria and, based on this process, concluded consequences in the last quarter.

The proposed model has novelty due to these reasons:

- It reveals a new perspective for strategy formulation that improves in several aspects. This enables experts and strategists to incur.
- There is no study in the history of strategy planning and decision-making with multiple attributes to measure the performance of strategies.
- Application of the combined evaluation structure leads to an improved and reliable process that experts can comprehend.

3. METHODOLOGY

This section firstly introduces the SFA strategy processes and then describes the Best-worst MCDM steps.

3.1. SFA strategy processes

Child was one of the significant authors who discussed strategic choice amongst organizational theorists [24]. Čirjevskis and Novikova claimed that the concept of strategic choice initially originated from the perception that its operational strengths and opportunities define its direction [13]. Johnson et al. had a similar approach to strategic choice. They were the major contributors to the strategy choice viability by applying a clear model SFA of examining strategic opportunity through three assessment criteria: suitability, feasibility, and acceptability [25].

Strategic choices involve the options for strategy in terms of both the directions in which strategy might move and the methods by which strategy might be pursued. Once a set of strategic options has been established, it is time to evaluate their relative merits. The SFA framework suggests three criteria (see Table 2). Suitability asks whether a strategy addresses the key issues relating to the opportunities and constraints an organization faces. Acceptability asks whether a strategy meets the expectations of the stakeholders. Last, feasibility invites an explicit consideration of whether a strategy could work in practice. In other words, suitability is related to its strategic position and whether its strategic choice matches the external environment and company resources and capabilities. Feasibility is concerned with assessing the company's internal capabilities in terms of financial resources. Finally, acceptability relates to evaluating whether the chosen strategies can meet stakeholders' expectations in terms of outcomes. According to this model, strategic options should be evaluated before implementing them in a new context. Three 'strategic option evaluation tests' are suggested, which helps us evaluate this nature's strategic choice before applying it to a particular environment. These are the suitability test, acceptability test, and feasibility test. The suitability test considers whether the option is the right one in given circumstances. The acceptability test considers whether the strategic option will gain crucial support from the corresponding parties or lead to opposition or criticism. Further, the feasibility test considers whether a company can successfully carry out the strategic option [25].

Table 2 The SAF criteria and techniques of evaluation

The SAF criteria	Scope
Suitability (focused on external factors)	▪ Does a proposed strategy address the key **opportunities** and **constraints** an organization faces?
Acceptability (focused on the internal factor)	▪ Does a proposed strategy meet the expectations of stakeholders? ▪ Is the level of risk acceptable? ▪ Is the likely return acceptable? ▪ Will stakeholders accept the strategy?
Feasibility	▪ Would a proposed strategy work in practice? ▪ Can the strategy be financed? ▪ Do people and their skills exist, or can they be obtained? ▪ Can the required resources be obtained and integrated?

3.2. Best-worst method (BWM)

Rezaei proposed a new MCDM method called the best-worst method (BWM). The BWM method has made substantial advancements in weight determination. According to BWM, the decision-maker identifies the best (e.g. most desirable, most important) and the worst (e.g. least desirable, least important) criteria. Pairwise comparisons are then conducted between these two criteria (best and worst) and the other ones. A max-min problem is then formulated and solved to determine the weights of different criteria. The weights of the alternatives concerning different criteria are obtained using the same process. The alternatives' final scores are derived by aggregating the weights from different criteria and alternatives, based on the best alternative which is selected [26].

BWM has been successfully applied in many areas. Torkayesh et al. applied it for the assessment of healthcare sectors in Eastern European countries [27]. Pamucar et al. addressed BWM to select the most preferred renewable energy source for a developing country [28]. Ecer performed it for the sustainability evaluation of wind plants [29]. For sustainable supplier evaluation, Ecer and Pamucar utilized the BWM technique [30]. Hashemkhani Zolfani et al. handled it for selecting the best location for a newcomer in Chile [31]. Besides, some researchers performed it successfully in various fields [32-35]. The steps of the BWM method for calculating the weights of criteria are defined below.

Step 1: In this step, decision-makers determine a set of decision criteria.

Step 2: After selecting decision criteria, they should separate the best and the worst criteria.

Step 3: The preference of the best criterion over all the other criteria should be determined, for this we could use a number between 1 and 9. The resulting Best-to-Others vector would be:

$$A_B = (a_{B1}, a_{B2}, ..., a_{Bn}),$$

where a_{Bj} indicates the preference of best criterion B over criterion j and a_{BB} =1.

Step 4: The preference of all the criteria over the worst criterion is determined, and for this we could use a number between 1 and 9. The resulting Others-to-Worst vector would be:

$$A_w = (a_{1w}, a_{2w}, ..., a_{nw})^T$$

where a_{jw} indicates the preference of criterion j over worst criterion W and a_{ww} =1.

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

$$\min \max_j \left\{ \left|\frac{w_B}{w_j} - a_{Bj}\right|, \left|\frac{w_j}{w_w} - a_{jw}\right| \right\} \tag{1}$$

s.t.

$$\sum_j w_j = 1 \tag{2}$$

$$w_j \geq 0, \; for \; all \; j \tag{3}$$

The above formulation could be transferred to the following formulation:

$$\text{Min } \xi \tag{4}$$

s.t.

$$\left|\frac{w_B}{w_j} - a_{Bj}\right| \leq \xi, \; for \; all \; j \tag{5}$$

$$\left|\frac{w_j}{w_w} - a_{jw}\right| \leq \xi, \; for \; all \; j \tag{6}$$

$$\sum_j w_j = 1 \tag{7}$$

$$w_j \geq 0, \; for \; all \; j \tag{8}$$

By solving the above formulation, the optimal weights $(w_1^*, w_2^*, ..., w_n^*)$ and ξ^* are obtained [26].

3.3. Measurement alternatives and ranking according to compromise solution (MARCOS)

This method determines ideal and anti-ideal alternatives as reference values and then defines the relationship – represented as a utility function in the MARCOS method - between them and other alternatives. Though it has been introduced very recently, it attracted considerable attention from researcher communities [27], [36-41]. The following are the steps of the MARCOS method [42].

Step 1: Formation of decision-making matrix. In this step, a matrix with n criteria and m alternatives is defined.

Step 2: Determination of ideal (AI) and anti-ideal solution (AAI) and extended decision matrix.

$$AAI = \min \; x_{ij} \quad \text{if j} \in \text{beneficial} \quad \text{and} \; \max \; x_{ij} \quad \text{if} \quad \text{j} \in \text{non- beneficial} \tag{9}$$

$$AI = \max \ x_{ij} \ \text{ if j } \in \text{ non-beneficial } \ \text{ and } \min x_{ij} \ \text{ if } \ j \in \text{beneficial} \tag{10}$$

Step 3: Normalization of the extended decision matrix.

$$n_{ij} = \frac{x_{ai}}{x_{ij}} \qquad \text{if j non-beneficial} \tag{11}$$

$$n_{ij} = \frac{x_{ij}}{x_{ai}} \qquad \text{if j} \quad \text{beneficial} \tag{12}$$

Step 4: Determination of the weighted matrix:

$$v_{ij} = n_{ij} * w_j \tag{13}$$

Step 5: Calculation of the Utility degree of alternatives K_i.

$$K_i^- = \frac{S_i}{S_{anti-ideal}} \tag{14}$$

$$K_i^+ = \frac{S_i}{S_{ideal}} \tag{15}$$

$$S_i = \sum_{i=1}^{n} v_{ij} \tag{16}$$

Step 6: Determination of the utility function of alternatives $f(K_i)$.

$$f(K_i) = \frac{K_i^+ + K_i^-}{1 + \frac{1 - f(K_i^+)}{f(K_i^+)} + \frac{1 - f(K_i^-)}{f(K_i^-)}} \tag{17}$$

Utility function in relation to the anti-ideal solution:

$$f(K_i^-) = \frac{K_i^+}{K_i^+ + K_i^-} \tag{18}$$

Utility function in relation to the anti-ideal solution:

$$f(K_i^+) = \frac{K_i^-}{K_i^+ + K_i^-} \tag{19}$$

Step 7: Ranking the alternatives. All alternatives are ranked as per their values of utility functions.

The advantages of the MARCOS method are: it considers an anti-ideal and ideal solution at the very beginning of the formation of an initial matrix, it proposes a new way of determining utility functions and their aggregation, and the possibility to consider a large set of criteria and alternatives while maintaining the stability of the method [40]. The MARCOS method is also used in various fields like sustainable supplier selection in the healthcare industry [40], iron and steel industry [38], assessment of battery electricity [43], and integrated to other MCDM method like FUCOM [40], ITARA [39], and used as Fuzzy MARCOS [44].

As mentioned, the MARCOS method is proper for solving real-world business problems, helping decision-makers in multifaceted problems, and contributing to the Prospective Multiple Attribute Decision Making.

4. Application and Implementation

In the last decades, the farmed Atlantic salmon production was increased all over the world. Chile and Norway are recognized as the top producers by a 6% and 2% growth ratio in their production, respectively. For instance, during the first six months of 2020, Chile has produced 246,806 tons of Atlantic salmon, worth $ 1,731 million, indicating a 2.62% increase compared with the year before [45].

The greatest amount of this Chilean Salmon is exported to the US market. However, Chile could not find an acceptable market share in the European markets because of the powerful presence of its European competitor. Norway is exporting salmon not only over Europe but also over Asian countries like China and South Korea. Understandably, they would plan to increase their share of the Asian markets. Should Chile intend to capture the Asian market, it seems that the west of Asia is the best target market due to the below listed reasons:

First, as a major competitor, Norway has not done any activity for exporting salmon in this region until now. Second, the region enjoys considerable potential strategic benefits like the Arabian Sea and the Indian Ocean's availability. The target countries such as Iran, Saudi Arabia, and Turkey can also play as a hub for Chile to export its salmon to other countries. Considering all the above mentioned, this study's focus is on “the export of the Atlantic Salmon of Chile to the west of Asia’s region”, using the SFA strategy. The first step of this process is to define criteria for each category of the SFA.

One of the essential criteria that significantly affect foreign markets' investment is our products' "potential of the target market". Based on the FAO report in 2011, the main aquaculture producers in the west of Asia are Saudi Arabia and Iran [46]. These countries are the major producers in this region, but they cannot supply all their demands. This provides an investment opportunity for neighboring countries like Egypt to export their fishery products to the west of Asia. "Region's economic attractiveness" can be another factor to export. For example, the Emirates have the most prominent international airline in the world. Dubai International Airport had 88,242,099.000 passengers in 2017 [47]. The Emirates Group also announced that their revenue from the first six months of 2020-21 had been US$ 3.7 billion [48].Saudi Arabia is one of the places where approximately 2 million Muslims travel to this country for Hajj. Many tourists travel to Turkey and Iran annually because of their historical sites and cultural heritage. It’s figured out that West Asia is a critical and strategic location, with the potential of millions of passengers travelling to these lands.

Seafood consumption is an essential issue for investors to measure and estimate people's preferences in these countries. The United Arab Emirates (UAE) and Oman are the largest seafood consumers in the region by consuming about 28.6 kg per year. The other critical criteria are the "Country Risks" like economic risk, business environment risk, political risk, commercial risk, and financing risk. One of the criteria that significantly affect the target country's selection is the "Location and cost of transportation". As the distance between the two countries (as the exporter and the importer) increases, transportation costs are seriously growing.

Hence, as shown in Table 3 and Fig. 2, this research considers three countries (Saudi Arabia, the UAE, and Oman) as the Chilean Salmon fish export destination. From the countries mentioned above, Iran and Turkey are omitted. Due to international sanctions and unstable economic situations, Iran would not be a great option. Also, since maritime transportation has been one of the consideration criteria to select the target market, Turkey does not seem to be an optimal option for this purpose.

Iran and Turkey have been omitted according to the latest Trend-Economy site statistics. In 2018, Saudi Arabia, the UAE, and Oman imported fishery products $4, $5, and $15 million, respectively, and $19, $4, and $19 million 2019 [49]. Fishery importation to Saudi Arabia increased for nearly 5-times in one year. It can be concluded that Saudi Arabia has a remarkable potential for exporting fish. Economic attractiveness could be GDP growth, average inflation rate, macroeconomic stability, financial structure and development, and the target country's business environment.

Table 3 The sub-criteria of the Region's economic attractiveness

Sub-criteria	Country		
	Saudi Arabia	UAE	Oman
GDP Growth volatility	78.5	86	80.4
Average inflation rate	100	100	100
Macroeconomic stability	79	71	68.9
Financial structure and development	51	46.3	36.9
Business environment	81.3	88.7	68.2

Source: Global Foreign Direct Investment Country Attractiveness [50]

The annual consumption of seafood in Saudi Arabia, THE UEA, and Oman is 11.3, 24.71, and 28.54 kg/person, respectively [51]. The trend of seafood consumption per capita from 1961 to 2017 is attached in the Appendix.

Transportation cost is another critical criterion that the investors should consider because they determine the direct influence on export policy. They are transporting Fishery products while noticing that the live fish should be controlled under certain conditions. A more common way of transport is via sealed containers [52]. These containers should be insulated from heat, and it is necessary to provide adequate oxygen for fish during transport. The wholesalers usually use pure bottled oxygen for oxygenating water [53]. Airplanes or ships are usually preferred for Intra-continental transportation. Although ship Freightage is less expensive than airplanes, the boat's transit time is much longer than that of the airplanes. However, as mentioned before, the fish transport system needs some other types of elements and variables. When the transition time exceeds, maintenance costs and losses of fish will increase, too. For example, the ship freighted transit time from Chile to THE UEA is about 25 to 31 days and airplane Freighted is about 1 to 3 days. In order to investigate distances, consider just the distance from the target location to Chile. The shorter length is an advantage for the target location. Table 4 shows these distances.

Table 4 Distance from Chile to the target location

Distance (miles)	Saudi Arabia		UAE		Oman	
From Chile to	Flight	Ship	Flight	Ship	Flight	Ship
	8551	7430	9060	7873	9166	7965

Source: [54]

Based on Euler Hermes global study [55], the country risk consists of five parts (economic risk, business environment risk, political risk, commercial risk, and financing risk). This study uses five linguistic concepts as excellent, very good, good, bad, and worst for determining the value of these sub-criteria. Table 5 shows these values.

Table 5 Linguistic assessments of country risk sub-criteria

	Economic Risk	Business environment Risk	Political Risk	Commercial Risk	Financing Risk
Saudi Arabia	Good	Good	Bad	Worst	Very good
UAE	Good	Very good	Good	Worst	Good
Oman	Bad	Good	Good	Worst	Bad

Source: [56]

4.1. Research gap

The first step in the SFA method is to determine the criteria. Suitability is related to opportunities and constraints that an organization faces. The five criteria, the target market's potential, and the region's economic attractiveness, are involved in this group. The feasibility factors examine the strategy and scan its financial capability. The consumption of seafood of the target market and the cost of transportation are relevant to this group. Finally, the acceptability usually surveys the risk of strategy, so the country risk is placed in this group. Three countries, Saudi Arabia, the UAE, and Oman are considered Option 1, Option 2, and Option 3. Table 6 shows the SFA strategy and the criteria.

Table 6 The SFA strategy framework by related criteria

	Weight
Suitability	
▪ The potential of target market	W_1
▪ Region's economic attractiveness	W_2
Feasibility	
▪ Consumption of the seafood	W_3
▪ Location and cost of transportation	W_4
Acceptability	
▪ Country Risks	W_5

All of the criteria can be measured by nominal values, except one of them that is linguistic. The SFA strategy has not proposed a procedure for transmuting this linguistic value to nominal. One of the challenges is that the deals are not balanced, and calculating these values results in the wrong answers because data should be normalized for the measurement. SFA strategy table has a column that determines the weight of criteria. The gap is to determine the weights of each criterion, the function that MCDM methods will deliver.

The MCDM method normalization steps can convert linguistic concepts to nominal ones. Some of these methods help the researchers to determine criteria weights. According to these benefits of the MCDM methods, combining these methods with the SFA strategy is considered in this study.

4.2. Calculation with the proposed MCDM model

This study uses the BWM method as an MCDM method because it requires fewer comparisons and gives more trustworthy outcomes than the other weighting tools [73]. This method works by pairwise comparison of the criteria. Based on the BWM algorithm, the best and worst criteria among these five should be determined. The potential of the target market is rated as the best, and the location and transportation cost as the worst criterion. Considering Appendix from Table 8 to 22, we obtain these weights as $W_{\text{potential of target market}} = 0.4219$, $W_{\text{Region's economic attractiveness}} = 0.1734$, $W_{\text{Consumption of the sea-food}} = 0.2601$, $W_{\text{Location and cost of transportation}} = 0.0404$, and $W_{\text{Country Risks}} = 0.104$. The weights are achieved by the BWM excel file solver, which can be found in www.bestworstmethod.com.

The ranking of options in the SFA method is realized by the MARCOS method. Firstly, the decision matrix is defined. The decision matrix contains the values of the alternatives according to the criteria. The criteria consist of some sub-criteria. The decision matrix is given in Table 7. The MCDM method provides the possibility to convert linguistic values to nominal. As country risk values are linguistic, it is possible to convert them to nominal values. Risk is a negative criterion that means the lower values are better preferred. The linguistic values are excellent, good, bad, and worst transmitting to numbers 1 to 5, respectively (excellent count as 1). It has to be mentioned that commercial risk is omitted from the sub-criteria of country risk because three options have the same value. The average inflation rate is also neglected from the region's economic attractiveness for the same values.

In this study, the researchers used www.mcdm.app and extracted the results. The obtained values by MARCOS are (Saudi Arabia= 0.7281, UAE= 0.5281 and Oman= 0.8287). It turns out that Oman is the best destination for the Chilean fish market, while the UAE is the worst item based on our study.

Table 7 Decision matrix table

Criteria	Sub-criteria	Alternatives		
		Saudi Arabia	UAE	Oman
Potential of target market		19	4	19
Region's economic attractiveness	GDP Growth volatility	78.5	86	80.4
	Macroeconomic stability	79	71	68.9
	financial structure and development	51	46.3	36.9
	business environment	81.3	88.7	68.2
Consumption of the seafood		11.3	24.71	28.54
Location and cost of transportation	Flight	8551	9060	9166
	Ship	7430	7873	7969
Country Risks	Economic Risk	3	3	4
	Business environment Risk	3	2	3
	Political Risk	4	3	3
	Financing Risk	2	3	4

4.3. Discussion

To specify which country has a good potential for the fishery products market, this paper attempts to find the answer by utilizing the SFA strategy – as a strategic choice method- through MCDM methods.

Since the SFA strategy does not seem very efficient for the abovementioned situation, the researchers extended it by an integrated BWM-MARCOS methodology. This combination has also increased the capability of the SFA strategy to solve complex problems. According to the SFA framework, some related criteria and options should be defined. The evaluation criteria considered are ranked from the most significant to the least important as the potential of the target market, consumption of the seafood, region's economic attractiveness, country risks, location, and transportation cost, respectively. The Selected options are the names of three countries (Saudi Arabia, Oman, and the UAE). One country should be selected among these options as the best country to export Chilean fish to. Then, the criteria and alternatives are evaluated and ranked.

The results show that Oman is the most acceptable market for the Chilean fish market. Put it differently, by placing in first ranking, Oman best meets the criteria considered for the fish market.

Saudi Arabia is also considered one of the top leading countries for salmon export. Among the reforms that have started in Saudi Arabia, there are projects to encourage healthy living. They comprise the goals of increasing fish consumption. Therefore, importing salmon from Chile to this country is of critical importance. In the UAE, the aquaculture imports are approaching $ 100 million and they are mostly imported from Norway, Oman, India, and Turkey. Therefore, the UAE may have a substantial potential for Chile. Fig. 1 shows the structure of this combined method for the case study.

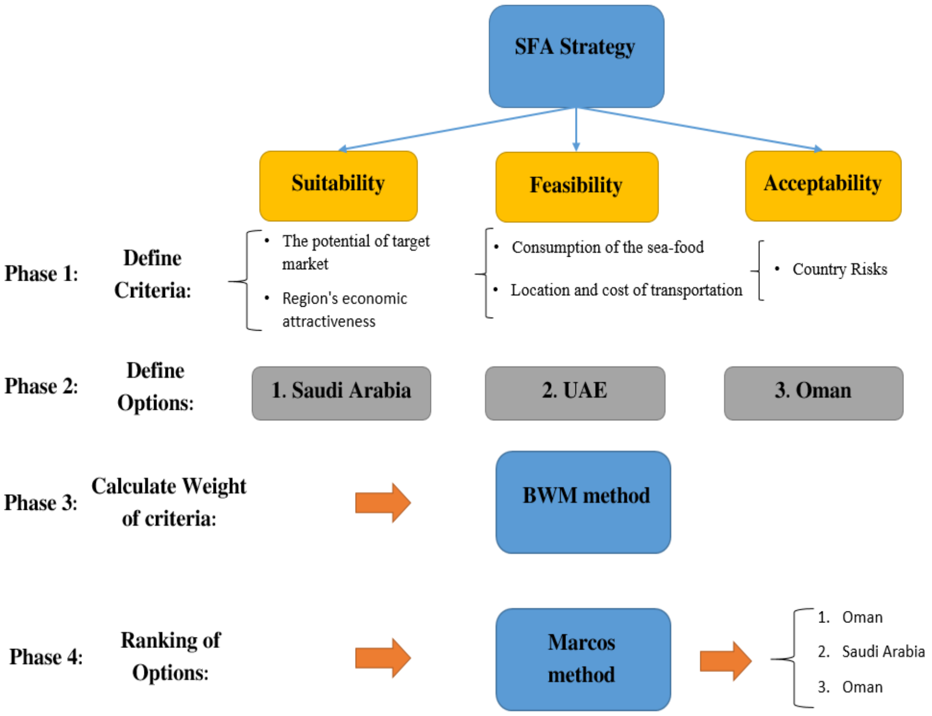

Fig. 1 The process and phases of the model

In order to verify the results, we have performed a sensitivity analysis by substituting the weights; we have noticed that the results are stable and confidential. Table 24 shows the random tests organized for analysis and Table 25 shows the ranking of the alternatives. In total, we observe that, based on 10 tests, Oman is still the best option while the UAE is judged to be the last choice.

5. CONCLUSIONS

The SFA strategy is the primary research method, which introduces some criteria and options and evaluates them. By increasing the complexity of a problem, the efficiency of this strategy decreases. SFA does not consider sub-criteria, a particular way of determining the weight, and a precise structure to prioritize the options. The deficiency of SFA bears in mind the idea of developing this method by using the MCDM methods, for instance, by applying the BWM method for determining the weight of criteria and by the MARCOS method for ranking alternatives or options. In addition, the combination of the MCDM methods with the SFA increases the accuracy of the selection process. A case study has been surveyed to implement the developed SFA approach. The case study was about exporting Chilean fish to West Asia. Three countries are considered as the alternatives, including Saudi Arabia, the UAE, and Oman. The target market's potential, region's economic attractiveness, consumption of the seafood, location and cost of transportation, and country risks were five criteria selected in this study.

The main challenge occurs in the process of resolving; the problem was that some criteria have nominal values and should be converted to a numeric value. This conversion in the MCDM methods is routine, but SFA does not propose a specific solution. Determining the weight of criteria in SFA has no straightforward, systematic approach. However, the BWM method calculates these weights clearly. Another problem with SFA was the absence of a normalization system. Using MCDM methods covers all of these problems. The proposed method can be used as a great tool for managers to choose the best strategy for complex and challenging problems of their company. This principle, which suggests selecting the best strategy, can be used by different sized entities from start-up teams to holding companies. This study suggests a framework by combining the advantages of BWM and MARCOS methods with the SFA strategy to identify the most appropriate target market for the Chilean fishery industry. The results showed that the best target market for Chilean fishery industry in Oman.

In the future studies, the researchers can develop the SFA method with other MCDM methods like SECA, EDAS, AHP, etc. Also, it is possible to integrate various weighting methods such as FUCOM, LBWA, MABAC, MAIRCA, etc. It is suggested to use fuzzy logic-based methods in order to model human judgments.

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REFERENCES

1. Durmaz, Y., Düşün, Z., 2016, *Importance of Strategic Management in Business*, Expert Journal of Business and Management, 4(1), pp. 38-45.
2. FMVA, 2021, https://corporatefinanceinstitute.com/resources/knowledge/strategy/strategic-planning/ [Last access: 11. July 2020]
3. Downey, J. *Cimaglobal*, https://www.cimaglobal.com/. [Last access: 13 February 2008].
4. Lee, T., Shin, J., Kim J., Singh, V., 2020, *Stochastic simulation on reproducing long-term memory of hydroclimatological variables using deep learning model*, Journal of Hydrology, 582, pp. 124-540.
5. Sahani, N., 2021, *Application of hybrid SWOT-AHP-FuzzyAHP model for formulation and prioritization of ecotourism strategies in Western Himalaya, India*, International Journal of Geoheritage and Parks, doi: 10.1016/j.ijgeop.2021.08.001.
6. Johnson, G., Scholes, K., Whittington, R., 1998, *Exploring corporate Strategy*, Fifth ed., London: the Prentice Hall imprint of pearson education.
7. Zavadskas, E., Antucheviciene, J., Chatterjee, P., 2019, *Multiple Criteria Decision Making (MCDM) Techniques for Business Processes Information Management*, MDPI Books, p. 320.
8. Mehrjerdi, Z., 2014, *Strategic system selection with linguistic preferences and grey information using MCDM*, Applied Soft Computing, 18, pp. 323-337.
9. Shyur, H., Shih, H., 2006, *A hybrid MCDM model for strategic vendor selection*, Mathematical and Computer Modelling, 44(7-8), pp. 749-761.
10. Banihabib, M.E., Hashemi-Madani, F.-S, Forghani, A., 2017, *Comparison of Compensatory and non-Compensatory Multi Criteria Decision Making Models in Water Resources Strategic Management*, European Water Resources Association (EWRA), 31(12), pp. 3745-3759.
11. Hashemkhani Zolfani, S., Ebadi Torkayesh, A., Ecer, F., Turskis, Z., Šaparauskas, J., 2021, *International market selection: a MABA based EDAS analysis framework*, Oeconomia Copernicana, 12(1), pp. 99-124.
12. Georgise, F., Mindaye, A., 2020, *Kaizen implementation in industries of Southern Ethiopia: Challenges and feasibility*, Cogent Engineering, 7, 1823157.
13. Čirjevskis, A., Novikova, J., 2012, *Commercial Viability of Strategic Choice on Green Business: Hydro Power versus Wind Power (Latvian case)*, AASRI Procedia, 2, pp. 44-49.
14. Alimardani, M., Hashemkhani Zolfani, S., Aghdaie, M., Tamošaitienė, J., 2013, *A novel hybrid SWARA and VIKOR methodology for supplier selection in an agile environment*, Technological and Economic Development of Economy, 19(3), pp. 533-548.
15. Broniewicz, E., Ogrodnik, K., 2012, *A Comparative Evaluation of Multi-Criteria Analysis Methods for Sustainable Transport*, *Energies*, 14, 5100.
16. Mehrjerdi, Z., 2014, *Strategic system selection with linguistic preferences and grey information using MCDM*, Applied Soft Computing, 18, pp. 323-337.
17. Ullah, Z., Jehangir, M., Iqbal, J., 2016, *Potential for Community Based Ecotourism (CBE) along Balochistan Coast, Pakistan*, Global Regional Review, 1, pp. 178-192.
18. Puška, A., Stojanovic, I., Maksimović, A., Osmanovic, N., 2020, *Project meanagment software evaluation by using the measurement of alternatives and ranking according to compromise solution (MARCOS) method*, Operational Research in Engineering Sciences: Theory and Applications, 3(1), pp. 89-102.
19. Pamučar, D., Savin, L., 2020, *Multiple-criteria model for optimal off-road vehicle selection for passenger transportation: BWM-COPRAS model*, Vojnotehnički glasnik/Military Technical Courier, 68(1), pp. 28-64.
20. Hashemkhani Zolfani, S., Torkayesh, A., Bazrafshan, R., 2021, *Vision-based weighting system (VIWES) in prospective MADM*, Operational Research in Engineering Sciences: Theory and Applications, 4(2), pp. 140-150.
21. Hasheminasab, H., Hashemkhani Zolfani, S., Zavadskas, E., Kharrazi, M., Skare, M., 2021,. *A circular economy model for fossil fuel sustainable decisions based on MADM techniques*, EconomicResearch-EkonomskaIstraživanja, doi: 10.1080/1331677X.2021.1926305.
22. Behzad, M., Hashemkhani Zolfani, S., Pamucar, D., Behzad, M., *A comparative assessment of solid waste management performance in the Nordic countries based on BWM-EDAS*, Journal of Cleaner Production, 266, 122008.
23. Hashemi, A., Dowlatshahi, M., Nezamabadi-pour, H., 2020, *MFS-MCDM: Multi-label feature selection using multi-criteria decision making*, Knowledge-Based Systems, 206, 106365.
24. Child, J., 1972, *Organizational Structure, Environment and Performance: The Role of Strategic Choice*, Sociology, 6(1), pp. 1-22.
25. Johnson, G., Whittington, R., Scholes, K., 2011, *Exploring Strategy*, 9th ed., Pearson, London.
26. Rezaei, J., 2015, *Best-worst multi-criteria decision-making method*, Omega, 53, pp. 49-57.

27. Torkayesh, A., Zolfani, S.H., Khavand, M., Khazaelpour, P., 2021, *Landfill location selection for healthcare waste of urban areas using hybrid BWM-grey MARCOS model based on GIS*, Sustainable Cities and Society, 67, 102712.
28. Pamučar, D., Ecer, F., Cirovic, G., Arlasheedi, M., 2020, *Application of improved best worst method (BWM) in real-world problems*, Mathematics, 8(8), pp. 13-42.
29. Ecer, F., 2021, *Sustainability assessment of existing onshore wind plants in the context of triple bottom line: a best-worst method (BWM) based MCDM framework*, Environmental Science and Pollution Research, 28, pp. 19677–19693.
30. Ecer, F., Pamucar, D., 2020, *Sustainable supplier selection: A novel integrated fuzzy best worst method (F-BWM) and fuzzy CoCoSo with Bonferroni (CoCoSo'B) multi-criteria model*, Journal of Cleaner Production, 266, 121981.
31. Hashemkhani Zolfani, S., Mosharafiandehkordi, S.. Kutut, V., 2019, *A pre-planning for hotel locating according to the sustainability perspective based on BWM-WASPAS approach*, International Journal of Strategic Property Management, 23(6), pp. 405-419.
32. Gupta, H., Barua, M., 2017, *Supplier selection among SMEs on the basis of their green innovation ability using BWM and fuzzy TOPSIS*, Journal of Clear Production, 152, pp. 242-258.
33. Rahimi, S., Hafezalkotob, A., Monavari, S.M., Hafezalkotob, A., Rahimi, R., 2020, *Sustainable landfill site selection for municipal solid waste based on a hybrid decision-making approach: Fuzzy group BWM-MULTIMOORA-GIS*, Cleaner Production, 248, pp. 119-186.
34. Yadav, G., Mangla, S.K., Luthra, S., Jakhar, S., 2018, *Hybrid BWM-ELECTRE-based decision framework for effective offshore outsourcing adoption: a case study*, International Journal of Production Research, 56(18), pp. 6259-6278.
35. Moslem, S., Farooq, D., Ghorbanzadeh, O., Blaschke, T., 2020, *Application of the AHP-BWM model for evaluating driver behavior factors related to road safety: A case study for Budapest*, Symmetry, 12(2), 243.
36. Stević, Ž., Brković, N., 2020, *A novel integrated FUCOM-MARCOS model for evaluation of human resources in a transport company*, Logistics, 4(1), 4.
37. Ecer, F., Pamucar, D., 2021, *MARCOS technique under intuitionistic fuzzy environment for determining the COVID-19 pandemic performance of insurance companies in terms of healthcare services*, Applied Soft Computing, 104, 107199.
38. Chakraborty, S., Chattopadhyay, R., Chakraborty, S., 2020, *An integrated D-MARCOS method for supplier selection in an iron and steel industry*, Decision Making: Applications in Management and Engineering, 3(2), pp. 49-69.
39. Uluts, A., Karabasecic, D., Popovic, G., Stanujkic, D., Nguyen, P.T., Karakoy, C., 2020. *Development of a novel integrated CCSD-ITARA-MARCOS decision-making approach for stackers selection in a logistics system*, Mathematics, 8(10), 1672.
40. Stevic, Z., Brkovic, N., 2020, *A novel integrated FUCOM-MARCOS model for evaluation of human resources in a transport company*, Logistics, 4(1), 4.
41. Stankovic, M., Stevic, Z., Das, D.K., Pamucar, D., 2020, *A new fuzzy MARCOS method for road traffic risk analysis*, Mathematics, 8(3), 457.
42. Stević, Z., Pamučar, D., Puška, A., Chatterjee, P., 2019, *Sustainable supplier selection in healthcare industries using a new MCDM method: Measurement Alternatives and Ranking according to COmpromise Solution (MARCOS)*, Computers & Industrial Engineering,140, pp. 106-231.
43. Ecer, F., 2021, *A consolidated MCDM framework for performance assessment of battery electric vehicles based on ranking strategies*, Renewable and Sustainable Energy Reviews, 143, 110916.
44. Boral, S., Chaturvedi, S., Howard, I., McKee, K., Naikan, V., 2020, *An Integrated Approach for Fuzzy Failure Mode and Effect Analysis Using Fuzzy AHP and Fuzzy MARCOS*, 2020 IEEE International Conference on Industrial Engineering and Engineering Management (IEEM), Singapore, doi: 10.1109/IEEM45057.2020.9309790.
45. FAO, 2021, *Optimism persists in farmed salmon sector despite price lull*, http://www.fao.org/in-action/globefish/market-reports/resource-detail/en/c/1263849/, USA (last access: 15. June 2021).
46. FAO, 2011, *Fisheries balance*, 2011, Available: http://www.fao.org/in-action/globefish/fishery-information/resource-detail/zh/c/338542/, (last access: 15. January 2012)
47. Department of Civil Aviation_Dubai, 2017, *United Arab Emirates Passenger Traffic: Dubai International Airport: Annual*,. [Online]. https://www.ceicdata.com/en/united-arab-emirates/air-transport-passenger-traffic/passenger-traffic-dubai-international-airport-annual (last access: 15. June 2021)
48. The Emirates Group, 2021, https://www.emirates.com/media-centre/emirates-group-announces-half-year-performance-for-2020-21/. (last access: 15. June 2021)
49. Annual International Trade Statistics by Country, 2021, https://trendeconomy.com. (last access: 15. June 2021)
50. Riadh, B., *fdiattractiveness*, 2020, http://www.fdiattractiveness.com/ranking-2020/. (last access: 15. June 2021)

51. Ourworldindata, *Fish and seafood consumption per capita, 1961 to 2017*, 2017, https://ourworldindata.org/grapher/fish-and-seafood-consumption-percapita?tab=chart&time=1961..latest&region=Asia&country=SAU~ARE~OMN, (last access: 15. June 2021)
52. FAO, 1980, Available: http://www.fao.org/3/af000e/AF000E03.htm, (last access: 15. June 2021)
53. The Fish site, *Transporting Fish*, 2006, https://thefishsite.com/articles/transporting-fish, (last access: 15. June 2021)
54. Travel_math, 2021, https://www.travelmath.com/distance/from/Chile/to/, (last access: 15. June 2021)
55. Hermese, E., *2019 Global Business Monitor*, 2019, https://www.eulerhermes.com/en_global/news-insights/economic-insights/2019-Global-Business-Monitor.html, (last access: 15. June 2021)
56. Euler Hermes global, *Economic research, Country Risk*, 2019, https://www.eulerhermes.com, (last access: 15. June 2021)
57. Li, T., Li, A., Guo, X., 2020, *The sustainable development-oriented development and utilization of renewable energy industry - a comprehensive analysis of MCDM methods*, Energy, 212, 118694.
58. Li, H., Horan, P., Luther, M., Ahmed, T., 2019, *Informed decision making of battery storage for solar-PV homes using smart meter data*, Energy & Buildings, 198, pp. 491-502.
59. Li, X., Tian, P., Leung, S., 2010, *Vehicle routing problems with time windows and stochastic travel and service times: Models and algorithm*, International Journal of Production Economics, 125(1), pp. 137-145.
60. Zavadskas, E., Turskis, Z., 2010, *A new additive ratio assessment (ARAS) method in multicriteria decision‐making*, Technological and economic development OF ECONOMY, 16(2), pp. 159-172.
61. Zavadskas, E., Kaklauskas, A., 1996, *Determination of an efficient contractor by using the new method of multicriteria assessment*, in Langford, D.A., Retik, A. (Eds.), *Managing the Construction Project and Managing Risk*, vol. 65, London, UK, Weinheim, Germany; New York, NY, USA; Tokyo, Japan; Melbourne, Australia; Madras, India; E and FN SPON: London, UK, In International Symposium for "The Organisation and Management of Construction", Shaping Theory and Practice 2, pp. 94-104.
62. Zavadskas, E., Turskis, Z., Vilutiene, T., 2010, *Multiple criteria analysis of foundation instalment alternatives by applying additive ratio assessment (ARAS) method*, Arch. Civ. Mech. Eng, 10(3), pp. 123-141.
63. Zavadskas, E., Turskis, Z., Antucheviciene, J., Zakarevicius, A., 2012, *Optimization of weighted aggregated sum product assessment*, Electron. Electr. Eng, 122(6), pp. 3-6.
64. Hashemkhani, S., Zavadskas, E., Khazaelpour, P., Cavallaro, F., 2018, *The Multi-Aspect Criterion in the PMADM Outline and Its Possible Application to Sustainability Assessment*, Sustainability, 10(12), 4451.
65. Hashemkhani Zolfani, S., Masaeli, R., 2020, *From Past to Present and into the Sustainable Future. PMADM Approach in Shaping Regulatory Policies of the Medical Device Industry in the New Sanction Period*, Sustainability Modeling in Engineering, 2019, pp. 73-95.
66. Hashemkhani Zolfani, S., Derakhti, A., 2020, *Synergies of Text Mining and Multiple Attribute Decision Making: A Criteria Selection and Weighting System in a Prospective MADM Outline*, Symmetry, 12(5), 868.
67. Hashemkhani Zolfani, S., Maknoon, R., Zavadskas, E., 2016, *An introduction to prospective multiple attribute decision making (PMADM)*, Technological and Economic Development of Economy, 22(2), pp. 309-326.
68. Johnson, D., McGeoch, L., Glover, F., Rego, C., 2000, *The Traveling Salesman Problem*, in *8th DIMACS Implementation Challenge*, http://dimacs.rutgers.edu/archive/Challenges/TSP/about.html.
69. Torkayesh, S.E., Amiri, A., Iranizad, A., Torkayesh, A.E., *Entropy based EDAS decision making model for neighborhood selection: A case study in Istanbul*, Journal of Industrial Engineering and Decision Making, 1(1), pp. 1-11, 2020.
70. Pamucar, D., Ćirović, G., 2015, *The selection of transport and handling resources in logistics centers using Multi-Attributive Border Approximation area Comparison (MABAC)*, Expert Systems with Applications, 42(6), pp. 3016-3028.
71. Ecer, F., 2018, *Third-party logistics (3PLs) provider selection via Fuzzy AHP and EDAS integrated model*, Technological and Economic Development of Economy, 24(2), pp. 615-634.
72. Yadav, S., Bajpai, U., 2018, *Performance evaluation of a rooftop solar photovoltaic power plant in Northern India*, Energy for Sustainable Development, 43, pp. 130-138.
73. Sotoudeh-Anvari, A., Sadjadi, S., Molana, S., & Sadi-Nezhad, S. 2018, *A new MCDM-based approach using BWM and SAW for optimal search model*. Decision Science Letters, 7(4), pp. 395-404.

APPENDIX

ADDITIONAL FIGURES AND TABLES

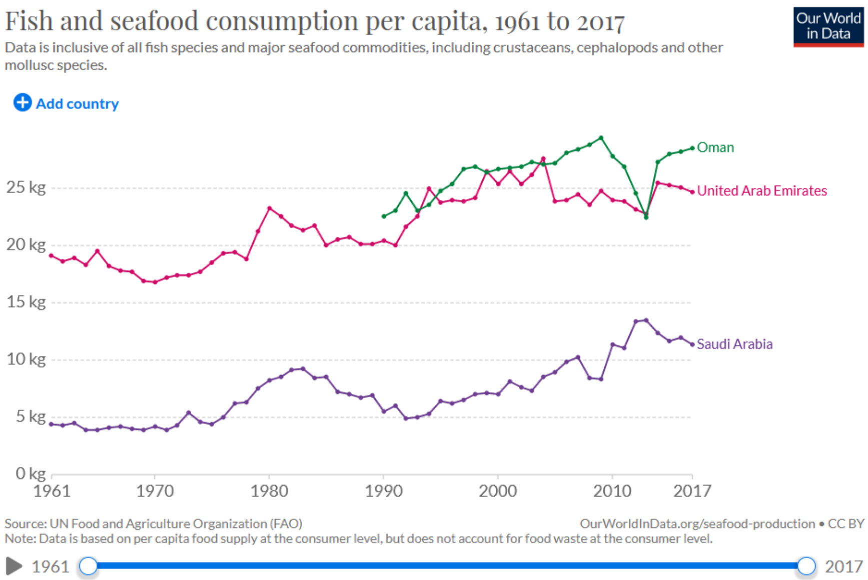

Fig. 2 Seafood consumption of the three countries from 1961 to 2017 [51]

Table 8 Enter the names of the criteria (Step 1)

Criteria Names of Criteria	Criterion 1 Potential of target market	Criterion 2 Region's economic attractiveness	Criterion 3 Consumption of the seafood	Criterion 4 Location and cost of transportation	Criterion 5 Country Risks

Table 8 Select the Best and the Worst (Step 2)

Best	Potential of target market
Worst	Location and cost of transportation

Table 9 Enter the decision-maker's preferences (Best to others: BO vector) (Step 3)

Best to Others	Potential of target market	Region's economic attractiveness	Consumption of the seafood	Location and cost of transportation	Country Risks
Potential of target market	1	3	2	8	5

Table 10 Enter the decision-maker's preferences (Others to Worst: OW vector) (Step 4)

Others to the Worst	Location and cost of transportation
Potential of target market	8
Region's economic attractiveness	6
Consumption of the seafood	7
Location and cost of transportation	1
Country Risks	5

Table 11 The weights of criteria

Weights	Potential of target market	Region's economic attractiveness	Consumption of the seafood	Location and cost of transportation	Country Risks
	0.4219	0.1734	0.2601	0.0404	0.1040

Calculating Sub-criteria weights of the Region's economic attractiveness by the BWM method:

Table 12 Enter the names of the sub-criteria of Region's economic attractiveness (Step 1)

Criteria	Criterion 1	Criterion 2	Criterion 3	Criterion 4
Sub-Criteria	GDP Growth volatility	Macroeconomic stability	Financial structure and development	Business environment

Table 13 Select the Best and the Worst (Step 2)

Best	Macroeconomic stability
Worst	Financial structure and development

Table 14 Enter the decision-maker's preferences (Best to others: BO vector) (Step 3)

	GDP growth volatility	Macroeconomic stability	Financial structure and development	Business environment
Macroeconomic stability	4	1	8	3

Table 15 Enter the decision-maker's preferences (Others to Worst: OW vector) (Step 4)

Others to the Worst	Financial structure and development
GDP Growth volatility	7
Macroeconomic stability	8
Financial structure and development	1
Business environment	6

Table 16 The weights of sub-criteria of Region's economic attractiveness

	GDP Growth volatility	Macroeconomic stability	Financial structure and development	Business environment
Weights	0.1755	0.5425	0.0478	0.2340

Table 17 Sub-criteria of country risks (Step 1)

Criterion 1	Criterion 2	Criterion 3	Criterion 4
Economic risk	Business environment risk	Political risk	Financing risk

Table 18 Select the Best and the Worst (Step 2)

Best	Financing Risk
Worst	Political Risk

Table 19 Enter the decision-maker's preferences (Best to others: BO vector) (Step 3)

Best to others	Economic risk	Business environment risk	Political risk	Financing risk
Financing risk	2	2	6	1

Table 20 Enter the decision-maker's preferences (Others to Worst: OW vector) (Step 4)

Others to the Worst	Political Risk
Economic Risk	5
Business environment Risk	5
Political Risk	1
Financing Risk	6

Table 21 The weights of sub- criteria of economy Risk attractiveness

	Economic Risk	Business environment risk	Political risk	Financing risk
Weights	0.25	0.25	0.0625	0.4375

Table 22 Ranking of Alternatives

Weight	0.42	0.02	0.091	0.007	0.039	0.26	0.01	0.025	0.025	0.025	0.006	0.04
Beneficial (B) or Non- Beneficial (NB)	B	B	B	B	B	B	NB	NB	NB	NB	NB	NB
Criteria	C_1	C_2	C_3	C_4	C_5	C_6	C_7	C_8	C_9	C_{10}	C_{11}	C_{12}
Alternative 1	19	78.5	79	51	81.3	11.3	8551	7430	3	3	4	2
Alternative 2	4	86	71	46.3	88.7	24.7	9060	7873	3	2	3	3
Alternative 3	19	80.4	68.9	36.9	68.2	28.54	9166	7969	4	3	3	4

Table 23 Sensitivity analysis tests

	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11	C12
Original weights	0.42	0.02	0.091	0.007	0.039	0.26	0.01	0.025	0.025	0.025	0.006	0.04
T1	0.42	0.02	0.091	0.006	0.039	0.26	0.01	0.025	0.025	0.025	0.007	0.04
T2	0.42	0.02	0.091	0.007	0.039	0.26	0.025	0.01	0.025	0.025	0.006	0.04
T3	0.42	0.02	0.091	0.006	0.04	0.26	0.025	0.01	0.025	0.025	0.006	0.039
T4	0.42	0.02	0.01	0.007	0.039	0.26	0.091	0.025	0.025	0.025	0.006	0.039
T5	0.42	0.02	0.091	0.007	0.039	0.26	0.01	0.025	0.025	0.025	0.04	0.006
T6	0.42	0.02	0.025	0.025	0.039	0.26	0.01	0.091	0.007	0.025	0.04	0.006
T7	0.26	0.02	0.091	0.007	0.039	0.42	0.01	0.025	0.025	0.025	0.006	0.04
T8	0.26	0.091	0.02	0.006	0.039	0.42	0.01	0.025	0.025	0.025	0.006	0.04
T9	0.26	0.02	0.091	0.006	0.039	0.42	0.01	0.04	0.006	0.025	0.025	0.025
T10	0.091	0.02	0.42	0.006	0.039	0.26	0.01	0.025	0.025	0.025	0.006	0.04

Table 24 Ranking results of sensitivity analysis

		Original rank score	Test 1	Test 2	Test 3	Test 4	Test 5	Test 6	Test 7	Test 8	Test 9	Test 10
	Alt-1	0.7281	0.7279	0.7281	0.7279	0.7263	0.7175	0.7163	0.6308	0.6242	0.6244	0.6529
	Alt-2	0.5272	0.5272	0.5272	0.5272	0.5292	0.5354	0.5357	0.6144	0.6199	0.6161	0.6585
	Alt-3	0.8297	0.83	0.8297	0.8302	0.8327	0.8419	0.8437	0.8181	0.8213	0.8260	0.7098
Ranking	Alt-1	2	2	2	2	2	2	2	2	2	2	3
	Alt-2	3	3	3	3	3	3	3	3	3	3	2
	Alt-3	1	1	1	1	1	1	1	1	1	1	1