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Target market selection using fuzzy analytic hierarchy process (AHP) and technique for order preference by similarity to ideal solution (TOPSIS) methods

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In today’s highly competitive environment, a lucrative market selection process is very important to the success of any business organization. In this context, the choice target market selection represents one of the most important functions to be performed by the division exporters. Target market selection is a multi-criterion problem which includes both qualitative and quantitative criteria. A trade-off between these tangible and intangible factors is essential in selecting the best target market. Proposed approach is based on fuzzy analytic hierarchy process (FAHP) and technique for order preference by similarity to ideal solution (TOPSIS) methods. FAHP method is used in determining the weights of the criteria by decision target market and then rankings of the target market are determined by TOPSIS method.

Key words: Target market, analytic hierarchy process (AHP), technique for order preference by similarity to ideal solution (TOPSIS), fuzzy, saffron.

INTRODUCTION

Experience has shown that the problem of ranking alternatives is no easy matter. It involves a multiplicity of complex considerations. And yet, particularly with regard to linguistic terms are difficult to evaluate. The fuzzy set theory is ideal for sorting through the maze of vague and at times conflicting information (Ding, 2011). Marketing touches every aspect of your business’s operation. It is a series of activities designed to identify customer needs and wants, and satisfy these while making a reasonable profit on a quality product or service. These activities include market research and analysis, product development, pricing, advertising, promotions, publicity, sales and customer service. Developing a marketing plan is one of the most important things you can do to ensure that your business will make a profit.

There are six basic reasons for developing a marketing plan:

1) It forces you to identify your target market.
2) It forces you to think about both short and long-term marketing strategies.
3) It looks at your business as a whole and ties together market objectives.
4) It allocates limited resources to create the greatest return.
5) It provides a guide to measure progress and outcome.
6) It gives clarity to who does what, when, with what marketing tools.

Marketing research is defined as a series of activities designed to identify customer needs and wants, and satisfy these while making a reasonable profit on a quality product or service. These activities include market research and analysis. Most entrepreneurs believe that
market research and analysis is something that only marketing professionals and statisticians are able to do. This is not the case. Marketing research is simply an orderly, objective way of learning about your potential customers and your competition. Marketing research does not have to be complex and expensive. Moreover, it is not a perfect science; it deals with people and their constantly changing likes and dislikes which can be affected by hundreds of influences, many of which simply cannot be identified. Multi-criteria decision making refers to find the best opinion from all of the feasible alternatives in the presence of multiple, usually conflicting, decision criteria (Isiklar and Büyüközkan, 2007). AHP technique investigated in the present study is a multi-criteria decision making technique developed by Saaty (1980). Although, traditional AHP technique may display expert knowledge, it can not reflect human thinking (Kahraman et al., 2003). Therefore, FAHP technique was developed (Van Laarhoven and Pedrycz, 1983; Buckley, 1985; Chang, 1996). TOPSIS method was firstly proposed by Hwang and Yoon (1981). According to this technique, the best alternative would be the one that is nearest to the positive ideal solution and farthest from the negative ideal solution (Lin et al., 2008; Benitez et al., 2007). FAHP and TOPSIS methods can be used together for complex decision problems (Chen and Tzeng, 2004; Ertuğrul and Karakasoğlu, 2007; Gumus, 2008; Önüt and Sonera, 2008; Taho et al., 2007). Tolga et al. (2005) dealt with the problems of selecting target market by using fuzzy replacement analysis and AHP. In the present study, on the other hand, for the selection of target market, FAHP and TOPSIS method is examined by using attributes of target market. The average import saffron (c1): This indicator shows the potential of imported. Import grows (c2): This index represents the increase or decrease of the import market in the particular product is desired. This indicated a high positive index of market expansion and product imports is desirable to influence the market. Index in the global market share or the share of total world imports of saffron (c3). Per capita income (c4): This indicator shows the purchasing power of consumers in the country. Geographical distance (c5): The geographic distance is less, cost less to pay. So the result is higher profits.

Fuzzy sets and fuzzy numbers

Zadeh (1965) introduced the fuzzy set theory, which was oriented to the rationality of uncertainty due to imprecision or vagueness. A major contribution of fuzzy set theory is its capability of representing vague data (Kahraman et al., 2004). Fuzzy sets and fuzzy logic are powerful mathematical tools for modeling: uncertain systems in industry, nature and humanity; and facilitators for common-sense reasoning in decision making in the absence of complete and precise information (Ertuğrul and Karakasoğlu, 2007). Fuzzy set theory has been used as a way to quantify imprecise and vague data in data envelopment analysis models. In this study, we will attempt to approximate the relative efficiency by an imprecise value and increase the power of discrimination between efficient units (Hossainzadeh et al., 2011). The classical set theory is built on the fundamental concept of set of which is either a member or not a member. A sharp, crisp and unambiguous distinction exists between a member and non-member for any well defined set of entities in this theory and there is a very precise and clear boundary to indicate if an entity belongs to the set. But many real-world applications cannot be described and handled by classical set theory (Chen and Pham, 2001). A fuzzy set is an extension of a crisp set. Crisp sets only allow full membership or non-membership at all, whereas fuzzy sets allow partial membership.

Fuzzy numbers are the special classes of fuzzy quantities. A fuzzy number is a fuzzy quantity M that represents a generalization of a real number r. intuitively; M(x) should be a measure of how well M(x) “approximates” r (Nguyen and Walker, 2000). A fuzzy number M is a convex normalized fuzzy set. A fuzzy number is characterized by a given interval of real numbers, each with a grade of membership between 0 and 1. It is possible to use different fuzzy numbers according to the situation. Generally in practice triangular and trapezoidal fuzzy numbers are used (Klir and Yuan, 1995). In applications it is often convenient to work with triangular fuzzy numbers (TFNs) because of their computational simplicity, and they are useful in promoting representation and information processing in a fuzzy environment (Ertuğrul and Karakasoğlu, 2007). A triangular fuzzy number, M is shown in Figure 1 (Deng, 1999).

TFNs are defined by three real numbers, expressed as (l, m, u). The parameters l, m, and u, respectively, indicate the smallest possible value, the most promising value, and the largest possible value that describe a fuzzy event. Their membership functions are described as:

\[
\mu(x|m) = \begin{cases} 
0 & X < l \\
(x-l)/(m-l) & l \leq X \leq m \\
(u-x)/(u-m) & m \leq x \leq u \\
0 & x > u
\end{cases}
\]  

(1)

There are various operations on triangular fuzzy numbers. But here, three important operations used in this study are illustrated. If we define, two positive triangular fuzzy numbers \((l_1, m_1, u_1)\) and \((l_2, m_2, u_2)\) then:

\[
(l_1, m_1, u_1) + (l_2, m_2, u_2) = (l_1+l_2, m_1+m_2, u_1+u_2) \\
(l_1, m_1, u_1) \cdot (l_2, m_2, u_2) = (l_1l_2, m_1m_2, u_1u_2)
\]  

(2)  

(3)
(1, m, u)⁻¹ = (1/u, 1/m, 1/l)

Other algebraic operations with fuzzy numbers can be found in (Zimmermann, 1996; Kahraman, 2001; Kahraman et al., 2002).

FUZZY ANALYTIC HIERARCHY PROCESS (AHP)

There are many FAHP methods in literature (Van Laarhoven and Pedrycz, 1983; Buckley, 1985; Chang, 1996).

Let \( X = \{x_1, x_2, x_3, \ldots, x_n\} \) be an object set, and \( G = \{g_1, g_2, g_3, \ldots, g_n\} \) be a goal set. According to the method of Chang (1992, 1996) extent analysis, each object is taken and extent analysis for each goal, \( g_i \), is performed, respectively. Therefore, m extent analysis values for each object can be obtained, with the following signs:

\[
M^1 g_i, M^2 g_i, M^3 g_i, \ldots, M^m g_i \quad i = 1,2,\ldots, n
\]

Where \( M^j g_i \quad j = 1,2,\ldots,m \) all are TFNs. The steps of Chang’s extent analysis can be given as in the following (Chang, 1996):

Step 1: The value of fuzzy synthetic extent with respect to the i th object is defined as:

\[
S_i = \sum_{j=1}^{m} M^j g_i \otimes \left[ \sum_{i=1}^{n} \sum_{j=1}^{m} M^j g_i \right]^{-1}
\]

To obtain \( \sum_{j=1}^{m} M^j g_i \).

Perform the fuzzy addition operation of m extent analysis values for a particular matrix such that:

\[
\sum_{j=1}^{m} M^j g_i = \left( \sum_{i=1}^{m} l_j, \sum_{i=1}^{m} m_j, \sum_{i=1}^{m} u_j \right)
\]

(6)

and to obtain \( \sum_{i=1}^{n} \sum_{j=1}^{m} M^j g_i \) perform the fuzzy addition operation of \( M^j g_i \) (j = 1, 2,...,m) values such that:

\[
\sum_{i=1}^{n} \sum_{j=1}^{m} M^j g_i = \left( \sum_{i=1}^{m} l_j, \sum_{i=1}^{m} m_j, \sum_{i=1}^{m} u_j \right)
\]

(7)

and then compute the inverse of the vector above, such that:

\[
\left[ \sum_{i=1}^{n} \sum_{j=1}^{m} M^j g_i \right]^{-1} = \left( 1/\sum_{i=1}^{m} l_j, 1/\sum_{i=1}^{m} m_j, 1/\sum_{i=1}^{m} u_j \right)
\]

(8)

Step 2: As \( M_1 = (l_1, m_1, u_1) \) and \( M_2 = (l_2, m_2, u_2) \) are two triangular fuzzy numbers, the degree of possibility of \( M_2 \geq M_1 \) defined as:

\[
V(M_2 \geq M_1) = \sup_{y \geq x} \min(\mu_{M_1}(x), \mu_{M_2}(y))
\]

(9)

and can be equivalently expressed as follows:

\[
V(M_2 \geq M_1) = \text{hgt}(M_1 \cap M_2) = \mu_{M_2}(d)
\]

(10)

where:

\[
\mu_{M_2}(d) = \begin{cases} 
1 & m_2 \geq m_1 \\
0 & l_2 \geq u_2 \\
\frac{l_1-u_2}{(m_2-u_2)-(m_1-l_1)} & \text{otherwise}
\end{cases}
\]

(11)
Figure 2. The intersection between M1 and M2.

Figure 2 illustrates Equation (11) where d is the ordinate of the highest intersection point D between $\mu_{m1}$ and $\mu_{m2}$. To compare $M_1$ and $M_2$, we need both the values of $V(M_1 \geq M_2)$ and $V(M_2 \geq M_1)$.

Step 3: The degree possibility for a convex fuzzy number to be greater than k convex fuzzy $M_i$ ($i=1, 2, \ldots, k$) numbers can be defined by:

$$V(M \geq M_1, M_2, \ldots, M_k) = V[(M \geq M_1) \text{and} (M \geq M_2) \text{and} \ldots \text{and} (M \geq M_k)] = \min V(M \geq M_i), i = 1, 2, \ldots, k$$

(12)

Assume

$$d(A_i) = \min V(S_i \geq S_k), \text{for} k = 1, 2, \ldots, n; k \neq i$$

Then the weight vector is given by:

$$W' = (d'(A_1), d'(A_2), \ldots, d'(A_n))^T$$

(13)

Where $A_i$ ($i=1, 2 \ldots n$) are n elements.

Step 4: Via normalization, the normalized weight vectors are:

$$W = (d'(A_1), d'(A_2), \ldots, d'(A_n))^T$$

(14)

Where $W$ is a non-fuzzy number.

TECHNIQUE FOR ORDER PREFERENCE BY SIMILARITY TO IDEAL SOLUTION (TOPSIS) METHOD

Technique for order preference by similarity to ideal solution (TOPSIS) is one of the useful multi attribute decision making techniques that is very simple and easy to implement, so that it is used when the user prefers a simpler weighting approach. On the other hand, the AHP approach provides a decision hierarchy and requires pairwise comparison among criteria. The user needs a more detailed knowledge about the criteria in the decision hierarchy to make informed decisions in using the AHP (Lee et al., 2001). TOPSIS method was firstly proposed by Hwang and Yoon (1981). According to this technique, the best alternative would be the one that is nearest to the positive ideal solution and farthest from the negative ideal solution (Benitez et al., 2007). The positive ideal solution is a solution that maximizes the benefit criteria and minimizes the cost criteria, whereas the negative ideal solution maximizes the cost criteria and minimizes the benefit criteria (Wang and Elhag, 2006; Wang and Lee, 2007). In other words, the positive ideal solution is composed of all best values attainable of criteria, whereas the negative ideal solution consists of all worst values attainable of criteria (Ertuğrul and Karakasoğlu, 2007). In this study, TOPSIS method is used for determining the final ranking of the operating systems. The method is calculated as follows:

Step 1. Decision matrix is normalized via Equation (15):

$$r_{ij} = \frac{w_j}{\sqrt{\sum_{j=1}^{n} w_j^2}}, \quad j = 1, 2, \ldots, N; \quad i = 1, 2, \ldots, n$$

(15)
Step 2. Weighted normalized decision matrix is formed:

\[ v_{ij} = w_{ij} \times r_{ij}, j = 1,2, \ldots, J, i = 1,2, \ldots, n \]  

(16)

Step 3. Positive ideal solution (PIS) and negative ideal solution (NIS) are determined:

\[ A^+ = \{v_1^+, v_2^+, \ldots, v_n^+\} \quad \text{Maximum values} \]  

(17)

\[ A^- = \{v_1^-, v_2^-, \ldots, v_n^-\} \quad \text{Minimum values} \]  

(18)

Step 4. The distance of each alternative from PIS and NIS are calculated:

\[ d_i^+ = \sqrt{\sum_{j=1}^{n} (v_{ij} - v_j^+)^2}, i = 1,2, \ldots, J \]  

(19)

\[ d_i^- = \sqrt{\sum_{j=1}^{n} (v_{ij} - v_j^-)^2}, i = 1,2, \ldots, J \]  

(20)

Step 5. The closeness coefficient of each alternative is calculated:

\[ CC_i = \frac{d_i^-}{d_i^+ + d_i^-}, i = 1,2, \ldots, J \]  

(21)

Step 6. By comparing CCi values, the ranking of alternatives are determined.

**EMPIRICAL STUDY**

A numerical example is illustrated and trial data is used for selecting best target market according to decision maker or expert preference. Assume that twenty nine target markets are evaluated under a fuzzy environment. For selecting target market, main criteria C1-C5 are used in application, are explained in fuzzy sets and fuzzy numbers. Figure 3 shows the all main criteria.

To create pair wise comparison matrix, linguistic scale is used which is given in Table 1. According to decision maker's preferences for main criteria, pair wise comparison values are transformed into TFN's as in Table 2.

After forming fuzzy pair-wise comparison matrix,
Table 2. Fuzzy pair wise comparison matr 1.

<table>
<thead>
<tr>
<th>Criteria</th>
<th>C_1</th>
<th>C_2</th>
<th>C_3</th>
<th>C_4</th>
<th>C_5</th>
</tr>
</thead>
<tbody>
<tr>
<td>C_1</td>
<td>(1,1,1)</td>
<td>(5/7,9)</td>
<td>(3/5,7)</td>
<td>(1/3,5)</td>
<td>(1/7,1/5,1/3)</td>
</tr>
<tr>
<td>C_2</td>
<td>(1/9,1/7,1/5)</td>
<td>(1,1,1)</td>
<td>(1/3,5)</td>
<td>(1/5,1/3,1)</td>
<td>(3/5,7)</td>
</tr>
<tr>
<td>C_3</td>
<td>(1/7,1/5,1/3)</td>
<td>(1/5,1/3,1)</td>
<td>(1,1,1)</td>
<td>(1/5,1/3,1)</td>
<td>(5/7,9)</td>
</tr>
<tr>
<td>C_4</td>
<td>(1/5,1/3,1)</td>
<td>(1,3,5)</td>
<td>(1/3,5)</td>
<td>(1,1,1)</td>
<td>(1/7,1/5,1/3)</td>
</tr>
<tr>
<td>C_5</td>
<td>(3/5,7)</td>
<td>(1/7,1/5,1/3)</td>
<td>(1/9,1/7,1/5)</td>
<td>(3/5,7)</td>
<td>(1,1,1)</td>
</tr>
</tbody>
</table>

Weights of all criteria are determined by the help of FAHP. According to the FAHP method, firstly synthesis values must be calculated. From Table 1, synthesis values respect to main goal are calculated like in Equation (5):

\[
SC_1 = (10.14,16.2,22.33) \times (0.013,0.018,0.03) = (0.132,0.303,0.685)
\]
\[
SC_2 = (5.31,9.48,14.2) \times (0.013,0.018,0.03) = (0.069,0.0177,0.435)
\]
\[
SC_3 = (6.54,8.87,12.33) \times (0.013,0.018,0.03) = (0.085,0.166,0.378)
\]
\[
SC_4 = (3.34,7.53,12.33) \times (0.013,0.018,0.03) = (0.043,0.14,0.378)
\]
\[
SC_5 = (7.25,11.34,15.53) \times (0.013,0.018,0.03) = (0.094,0.212,0.476)
\]

These fuzzy values are compared by using Equation (11) and these values are obtained:

\[V(SC_1 \geq SC_2) = 1\]
\[V(SC_2 \geq SC_1) = 0.706\]
\[V(SC_3 \geq SC_1) = 0.642\]
\[V(SC_1 \geq SC_3) = 1 \quad V(SC_2 \geq SC_3) = 1\]
\[V(SC_3 \geq SC_2) = 0.964\]
\[V(SC_1 \geq SC_4) = 1 \quad V(SC_2 \geq SC_4) = 1\]
\[V(SC_3 \geq SC_4) = 1\]
\[V(SC_1 \geq SC_5) = 1\]
\[V(SC_2 \geq SC_5) = 0.907\]
\[V(SC_3 \geq SC_5) = 0.859\]
\[V(SC_4 \geq SC_1) = 0.602\]
\[V(SC_4 \geq SC_2) = 0.894\]

Then priority weights are calculated by using Equation (12):

\[d'(C_1) = \min(1,1,1,1) = 1\]
\[d'(C_2) = \min(0.706,1,1,0.907) = 0.706\]
\[d'(C_3) = \min(0.642,0.964,1,0.859) = 0.642\]
\[d'(C_4) = \min(0.602,0.894,0.921,0.799) = 0.602\]
\[d'(C_5) = \min(0.791,1,1,1) = 0.791\]

Priority weights form

\[W' = (1,0.706,0.642,0.602,0.791)\]

vector. After the
Table 3. Criteria values of target market.

<table>
<thead>
<tr>
<th>Importer</th>
<th>Mean import</th>
<th>Rate growth</th>
<th>Share import</th>
<th>Per capita income</th>
<th>Distance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spain</td>
<td>35967.67</td>
<td>72.74</td>
<td>29.07</td>
<td>2120.00</td>
<td>0.07</td>
</tr>
<tr>
<td>Italy</td>
<td>16474.67</td>
<td>85.92</td>
<td>13.32</td>
<td>26120.00</td>
<td>0.09</td>
</tr>
<tr>
<td>United States of America</td>
<td>9683.67</td>
<td>36.52</td>
<td>7.83</td>
<td>41400.00</td>
<td>0.03</td>
</tr>
<tr>
<td>France</td>
<td>6873.00</td>
<td>91.43</td>
<td>5.56</td>
<td>30090.00</td>
<td>0.07</td>
</tr>
<tr>
<td>Sweden</td>
<td>5957.67</td>
<td>54.74</td>
<td>4.82</td>
<td>35770.00</td>
<td>0.08</td>
</tr>
<tr>
<td>Switzerland</td>
<td>5152.00</td>
<td>77.01</td>
<td>4.16</td>
<td>48230.00</td>
<td>0.08</td>
</tr>
<tr>
<td>United Arab Emirates</td>
<td>12852.33</td>
<td>-16.05</td>
<td>10.39</td>
<td>39621.00</td>
<td>0.25</td>
</tr>
<tr>
<td>Japan</td>
<td>4197.00</td>
<td>86.18</td>
<td>3.99</td>
<td>37180.00</td>
<td>0.04</td>
</tr>
<tr>
<td>Argentina</td>
<td>3788.67</td>
<td>130.16</td>
<td>3.06</td>
<td>3720.00</td>
<td>0.03</td>
</tr>
<tr>
<td>United Kingdom</td>
<td>3262.00</td>
<td>59.57</td>
<td>2.64</td>
<td>33940.00</td>
<td>0.07</td>
</tr>
<tr>
<td>Germany</td>
<td>2782.67</td>
<td>82.97</td>
<td>2.25</td>
<td>30120.00</td>
<td>0.08</td>
</tr>
<tr>
<td>Saudi Arabia</td>
<td>2351.00</td>
<td>-22.49</td>
<td>1.90</td>
<td>10430.00</td>
<td>0.25</td>
</tr>
<tr>
<td>Belgium</td>
<td>1999.00</td>
<td>36.77</td>
<td>1.62</td>
<td>3130.00</td>
<td>0.07</td>
</tr>
<tr>
<td>India</td>
<td>2345.67</td>
<td>76.48</td>
<td>1.90</td>
<td>620.00</td>
<td>0.13</td>
</tr>
<tr>
<td>Chinese Taipei</td>
<td>1763.00</td>
<td>-35.71</td>
<td>1.42</td>
<td>1210.00</td>
<td>0.05</td>
</tr>
<tr>
<td>Canada</td>
<td>1154.00</td>
<td>68.50</td>
<td>0.93</td>
<td>28390.00</td>
<td>0.03</td>
</tr>
<tr>
<td>Austria</td>
<td>704.00</td>
<td>49.98</td>
<td>0.57</td>
<td>32300.00</td>
<td>0.10</td>
</tr>
<tr>
<td>Singapore</td>
<td>698.33</td>
<td>62.60</td>
<td>0.56</td>
<td>24220.00</td>
<td>0.05</td>
</tr>
<tr>
<td>Mexico</td>
<td>675.00</td>
<td>29.86</td>
<td>0.55</td>
<td>6770.00</td>
<td>0.03</td>
</tr>
<tr>
<td>Australia</td>
<td>588.33</td>
<td>55.30</td>
<td>0.48</td>
<td>26900.00</td>
<td>0.03</td>
</tr>
<tr>
<td>Kuwait</td>
<td>681.33</td>
<td>-0.57</td>
<td>0.55</td>
<td>17970.00</td>
<td>0.33</td>
</tr>
<tr>
<td>Netherlands</td>
<td>678.00</td>
<td>52.00</td>
<td>0.55</td>
<td>31700.00</td>
<td>0.07</td>
</tr>
<tr>
<td>Hong Kong, China</td>
<td>745.00</td>
<td>33.66</td>
<td>0.60</td>
<td>2680.00</td>
<td>0.06</td>
</tr>
<tr>
<td>Oman</td>
<td>789.67</td>
<td>25.94</td>
<td>0.64</td>
<td>7890.00</td>
<td>0.20</td>
</tr>
<tr>
<td>Portugal</td>
<td>80.00</td>
<td>67.62</td>
<td>0.06</td>
<td>14350.00</td>
<td>0.06</td>
</tr>
<tr>
<td>South Africa</td>
<td>351.33</td>
<td>49.63</td>
<td>0.28</td>
<td>3630.00</td>
<td>0.05</td>
</tr>
<tr>
<td>Bahrain</td>
<td>354.67</td>
<td>22.41</td>
<td>0.29</td>
<td>10840.00</td>
<td>0.29</td>
</tr>
<tr>
<td>Denmark</td>
<td>237.67</td>
<td>41.85</td>
<td>0.19</td>
<td>40650.00</td>
<td>0.08</td>
</tr>
<tr>
<td>Finland</td>
<td>270.00</td>
<td>4.75</td>
<td>0.22</td>
<td>32790.00</td>
<td>0.08</td>
</tr>
</tbody>
</table>

Normalization of these values priority weights respect to main goal are calculated as $$\{0.267,0.188,0.171,0.161,0.211\}$$. Normalization of these values is made via Equation (15). Then, weighted normalized matrix is formed by multiplying each value with their weights. All weighted values that form criterion are aggregated. Then, these aggregated values and the weights of each main criterion are multiplied to form Table 3.

Positive and negative ideal solutions are determined by taking the maximum and minimum values for each criterion:

$$A^+ = \{0.212, 0.01, 0.194, 0.736, 0.036\}$$

$$A^- = \{0.005, -0.0029, 0.0004, 0.0009, 0.0027\}$$

Then the distance of each firm from PIS and NIS with respect to each criterion are calculated with the help of Equations 19 and 20. Then closeness coefficient of each target market is calculated by using Equation 21 and the ranking of the target market are determined according to these values in Table 4. Considering Table 4, preferred target market is B for decision maker's preference. Different rankings can be obtained by using different decision maker's preference values.

CONCLUSION

With the selection of appropriate target market, organizations may have some positive results in a world of competition and globalization such as decreased in costs, time-efficiency and increased quality and increased work performance.

In this paper, FAHP and TOPSIS are integrated for selection of best target market FAHP is used for determining the weights of the criteria and priority values of target market. Then TOPSIS method is used for...
Table 5. Ranking of the target markets according to CCI values rank target market CCI.

<table>
<thead>
<tr>
<th>Rank</th>
<th>Country</th>
<th>CCI</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Spain</td>
<td>0.790403</td>
</tr>
<tr>
<td>2</td>
<td>Italy</td>
<td>0.478202</td>
</tr>
<tr>
<td>3</td>
<td>United Arab Emirates</td>
<td>0.422974</td>
</tr>
<tr>
<td>4</td>
<td>United States of America</td>
<td>0.362947</td>
</tr>
<tr>
<td>5</td>
<td>Switzerland</td>
<td>0.299923</td>
</tr>
<tr>
<td>6</td>
<td>France</td>
<td>0.284672</td>
</tr>
<tr>
<td>7</td>
<td>Sweden</td>
<td>0.279504</td>
</tr>
<tr>
<td>8</td>
<td>Japan</td>
<td>0.251747</td>
</tr>
<tr>
<td>9</td>
<td>United Kingdom</td>
<td>0.225933</td>
</tr>
<tr>
<td>10</td>
<td>Denmark</td>
<td>0.221747</td>
</tr>
<tr>
<td>11</td>
<td>Germany</td>
<td>0.205544</td>
</tr>
<tr>
<td>12</td>
<td>Austria</td>
<td>0.191732</td>
</tr>
<tr>
<td>13</td>
<td>Finland</td>
<td>0.190085</td>
</tr>
<tr>
<td>14</td>
<td>Netherlands</td>
<td>0.187674</td>
</tr>
<tr>
<td>15</td>
<td>Kuwait</td>
<td>0.176209</td>
</tr>
<tr>
<td>16</td>
<td>Canada</td>
<td>0.175508</td>
</tr>
<tr>
<td>17</td>
<td>Australia</td>
<td>0.163687</td>
</tr>
<tr>
<td>18</td>
<td>Saudi Arabia</td>
<td>0.153859</td>
</tr>
<tr>
<td>19</td>
<td>Singapore</td>
<td>0.152727</td>
</tr>
<tr>
<td>20</td>
<td>Argentina</td>
<td>0.145967</td>
</tr>
<tr>
<td>21</td>
<td>Bahrain</td>
<td>0.141726</td>
</tr>
<tr>
<td>22</td>
<td>India</td>
<td>0.109309</td>
</tr>
<tr>
<td>23</td>
<td>Oman</td>
<td>0.109132</td>
</tr>
<tr>
<td>24</td>
<td>Portugal</td>
<td>0.099608</td>
</tr>
<tr>
<td>25</td>
<td>Belgium</td>
<td>0.085274</td>
</tr>
<tr>
<td>26</td>
<td>Chinese Taipei</td>
<td>0.071325</td>
</tr>
<tr>
<td>27</td>
<td>Mexico</td>
<td>0.055281</td>
</tr>
<tr>
<td>28</td>
<td>Hong Kong China</td>
<td>0.044931</td>
</tr>
<tr>
<td>29</td>
<td>South Africa</td>
<td>0.041811</td>
</tr>
</tbody>
</table>

determining the ranking of the target market. FAHP is a useful approach for evaluating complex multiple criteria alternatives involving subjective and uncertain judgment. TOPSIS is one of the well known outranking methods for multiple-criteria decision-making and can be easily used for ranking alternatives. The integration of FAHP and TOPSIS approaches enables experts and users to efficiently select a more suitable target market for specific purpose and requirements. In future studies other multi-criteria methods can be used to select target market.

REFERENCES


