PRESENTING A PATTERN FOR SELECTING THE BEST CONTRACTOR AMONG CONTRACTORS PARTICIPATING IN THE BIDS OF NATION OIL COMPANY USING MULTI-INDEX DECISION-MAKING METHOD OF ELECTRE

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ABSTRACT

At present, the winner determined among participants in the auctions and bids (especially bids) in national oil company is merely conducted considering the price offered by them and this type of winner determining leads to emerging problems in performance and contract presentation stage. Per sent study is one of the most applied sciences which could be used as a powerful tool for solving decision-making problem by managers, and multi-criterion decision-making techniques are among these sciences. In addition to thinking and analyzing, decision-making requires appropriate tool and ELECTRE is one of the efficient tools in the discussion of multi-criterion decision-making. The society under study is the national oil company and the data is collected using questionnaire, interview card, library and field study and the contractors are ranked using this technique and the indexes defined.

KEYWORDS: Decision-making, multi-criterion, index, ELECTRE, national oil product Distribution Company

Decision-making is a requirement for life every person or organization makes numerous decisions that some of them have turned into a simple habit due to recurrence, but some of the decisions are sensitive and determining.

Decision-making besides thinking and analysis, requires suitable tool of which are techniques that have been studied in the multi-criterion decision-making discussion. These days, decision-making methods have considerably changed. Complexity, high cost of operation, and the spaciousness of organizations reveals the need to suitable decision-making methods and making proved decisions for managers. What managers need more than anything else is a corn for table, safe and practical too so as to help them in decision-making which encounter it occasionally or constantly. Quantitative techniques and applied mathematics tools could be efficient and helpful. Present investigation is on one of the most applied sciences which could be used as a strong tool for solving decision-making problems the science of multi-criterion decision-making although are considered among the new sciences, they have shown their capability in solving decision-making problems. Managers who are interested in the results of their decision-making can not ignore the science of multi-criterion decision-making. The survival of an organization in the competitive word is dependent on the decisions made by managers and these decisions determine the type and amount of the sources an organization posses or uses. Right decisions by managers results in the growth and promotion of an organization and wrong decisions lead to losing market and ultimately going bankrupt. In today’s world the valve of a manager is mostly assessed based on the quality of decisions made by him or her. Therefore, the managers must be familiar with the knowledge which helps them in decision-making and multi-criterion decision-making techniques are among these types of knowledge.

These days, the winner is determined among participants in the bids and auctions (especially bids) in national oil company given the price suggested and this results in emerging problems in the performance and contract presentation stages. Among these problems the comments made by the contractors them selves as for the suggestions are not made by experts and all aspects are not considered in presenting the price suggested could reveal the point and national oil company seeks to remove this deficiency. And even in some cases, assessment items are measured, too. But because of non-scientific nature of these measurements (weighing) and not resulting in comprehensive and complete conclusion leads to deceiving advantages from the side of participating contractors in auctions and bids which the company can not help using these methods in order to determine the participants separately and ultimately to determine the winner given the prices recommended. In the study conducted and among decision-making methods ELECTRE can solve the above-said deficiency and problem in the best way and helps in the right fair and scientific assigning of the winner and even in ranking the participants in auctions and bids considering all aspects of problems. This is done in tow
forms! That is, it first the items for assessing contractors are put in the frame work of ELECTRE and after ranking, puts some of the participants in price presentation stage and ultimately it considers the best suggested price as the winner or simultaneously and eclectically considers the assessment items and suggested price in the above-mentioned technique and in the end, selects the best choice. The company can select either method voluntarily and use it. ELECTRE is one of the popular and known methods in decision-making. Thus, a lot of investigative activities have been conducted on it. One of the studies titled “Determining the weight of the criteria in ELECTRE type methods using simos revision method” aims at determining the weight of criteria in indirect, simple and numerical form using a series of cards and simos software (Jose Figueira and Bernar Roy, 2002). Another article titled, “A new method for supporting decision-making groups based on ELECTRE III method” suggests that it could help decision-making by collective preference of a series of possible alternatives for achieving the goal or objective of suggesting or ranking related functions and through obtaining appropriate phase relationship (Tuan carlos legva and Eduardo Fernandez, 2003).

Another article in forms us of the pre tense of “Irregularities and chaos in ranking when the choices are assessed using some ELECTRE methods,” (Xiaothing wang and Evang los Trianta phyllia, 2008). Selecting construction contractors is conducted using Fuzzy Top six and in the end, the cortagena politecnica university model was presented using a case study for building construction project (And nieto and Francisco Run, 2013).

Behnam vaahdani et al. (2013) used compromise solution fuzzy method and also vikor method for selecting the best contractor. Some researchers showed the details of outranking method using ELECTRE, furthermore, a comparative study was conducted and then the validity assessment of results obtained in this method was compared with that of other methods (A. Hatami and M. Tavand, 2011).

In England Gary Halt (1996) studied the matter of contractor selection and presented different models. Russel et al. (1987) made a widespread attempt on the assessment and selection of con tractors in America. He specified his doctoral thesis specifically to this subject and suggested several structural and software approaches for it He also conducted cases studies on this subject in America. Some models have also been presented on the assessment and selection of contractors and a large number of activities have been conducted on the subject in Hong kong (Drew, D. S, 1993) (kumaraswany, M. M, 1996) (palaneeswavn, E and kumdrawamy, M, 2001). Also, some models were presented in sangapur, Saudi Arabia, Taiwan and Turkey on the assessment and selection of contractors (Bubshait and AL Gobail, 1996). (ling, F and liu, M, 2005. For examples “Topcu” in Turkey presented a three-criterion model which consisted of cost, quality and time (Topcu, Y. I, 2004). Also, sunmez (2002 & 2006) conducted useful studies on the assessment and selection of contractors and suppliers as well.

Using ELECTRE Technique (algorithm)

In this method instead of choice ranking, a new concept know as non ranking is used, in this way that AL → AK indicates that although the choices of K and L do not have any advantage or priority to one another, but DM accepts the risk of AK advantageous over that of AL.

In this method, all choices are assessed using non ranking scales and un effective choices are omitted.

First step (Forming Matrice (ND):

In order to make different measurement scales for various indexes comparable, the available decision-making matrice (matrice D) should be turned into a “scales” one, through which the elements of converted indexes (rij) are measured without dimension. Making Matrice scales in this technique is conducted using “Norm”, that is, each element (rij) from presumed decision-making matrice is divided into available norm from jth column based on x index which are all summarized as following:

Formula No (1): nij=\frac{rij}{\sum_{j=1}^{n}r_{ij}}

Where by all the columns of supposed matrice consists of similar unit length from corresponding vector and as result their general comparison become easier.

Second step) Forming heavy scale less matrice (V):

Forming heavy scale less matrice supposing W as input to algorithm means:

Supposed from (DM)

\[ W = \{W_1, W_2, \ldots \ldots W_n\} \]
Heavy scales matrice:\[ V = \begin{bmatrix} V_{11}, \ldots, V_{1j}, \ldots, V_{1n} \\ \vdots \\ \vdots \\ \vdots \\ V_{m1}, \ldots, V_{mj}, \ldots, V_{mn} \end{bmatrix} \]

\[ N_D = \text{matrice} N \times n \]

Third step) Determining harmonious and non harmonious sets:

For each pair of choices K and L, we will have:

K, L = 1, 2, ..., m; m ≠ K

The set of existing indexes \( J = \{ j | j = 1, 2, ..., n \} \) are divided into two subsets, that is, distinct harmonious set \( C_{KL} \) and distinct nonharmonious set \( D_{KL} \). The harmonious set \( C_{KL} \), from choices \( A_K \) and \( A_L \), will consist of indexes which \( A_K \) and \( A_L \) are preferred on them:

\[ C_{KL} = \{ j | r_{kj} \geq r_{lj} \} \]

Formula No (3): (Asgharpur, Mohammad javad, 1985)

And non harmonious set \( D_{KL} \) is a set of indexes which based on them we will have:

\[ D_{KL} = \{ j | r_{kj} < r_{lj} \} = J - C_{KL} \]


Fourth step) Forming harmonious matrice:

The possible value from harmonious set \( C_{KL} \) is measured using existing weights of the harmonious indexes in that set. That is, the harmonious criterion equals the sum of weights \( W_j \) from indexes which from the \( C_{KL} \) set, in this way the harmonious criterion \( C_{KL} \) lies between \( A_K \) and \( A_L \):

\[ C_{KL} = \sum_{j \in C_{KL}} W_j = 1 \] 

Formula No (5): (Asgharpur, Mohammad javad, 1987).

-Harmonious criterion \( C_{KL} \) reflects the relative importance from AK in relation to \( A_L \) in a way that we will have \( 0 \leq C_{KL} \leq 1 \).

Therefore, Frequent values from criteria from \( C_{KL} \) the harmonious asymmetric matrice:

\[ C = \begin{bmatrix} C_{12} & C_{13}, \ldots, C_{1m} \\ C_{21} & C_{23}, \ldots, C_{2m} \\ \vdots \end{bmatrix} \]

Matrice No (2): (Asgharpur, Mohammad javad, 1987)

Fifth step) forming Non harmonious matrice:

Non harmonious matrice V.S harmonious matrice indicates that how worse the assessment from \( A_K \) in reaction to \( A_L \) is. This criterion is computed using matrice elements \( V \):

Given the nonharmonious set of \( D_{KL} \):

\[ D_{KL} = \begin{bmatrix} d_{12} & d_{13}, \ldots, d_{1m} \\ d_{21} & d_{23}, \ldots, d_{2m} \\ \vdots \end{bmatrix} \]

Matrice No (6): (Asgharpur, Mohammad javad, 1989)

Thus, harmonious matrice (contrary matrice) based on all pair comparisons of choices is as follows:

\[ D = \begin{bmatrix} d_{12} & d_{13}, \ldots, d_{1m} \\ d_{21} & d_{23}, \ldots, d_{2m} \\ \vdots \end{bmatrix} \]

Formula No (7): (Asgharpur, Mohammad javad, 1990)

Seventh step) Determining threshold level of non harmonious matrice:

\[ D_{KL} \text{ elements of contrary matrice should also be measured in relation to a threshold value. This threshold value (D), for example, could be computed as following:} \]

\[ D = \Sigma_{k=1}^{m} \Sigma_{l=1}^{m} D_{kl} | m(m-1) \] 

Formul No (8): (Asgharpur, Mohammad javad, 1991)

Eighth step) Forming effective harmonious matrice (F):

Based on the least threshold C, a matrice with elements of zero and one is formed in such a way that:

\[ F = [f_{kl}] m \times m \text{ and } F_{kl} = \begin{cases} 1 & \text{if } C_{kl} \geq C \\ 0 & \text{if } C_{kl} < C \end{cases} \]

Formul No (9): (Asgharpur, Mohammad javad, 1992)

Each unit element in matrice indicates an effective and predominant choice over other one.

Ninth step) Forming effective non harmonious Matrice (G):
Based on the lest threshold D, a G matrice with elements of zero and one is formed in a way that:

\[ G = [g_{kl}] \text{ } m \times m \text{ and } g_{kl} = \begin{cases} 1 & \text{if } D_{kl} \leq D \\ 0 & \text{if } D_{kl} > D \end{cases} \]

Formula No. (10): (Asgharpur, Mohammad javad, 1992)

The unit elements in matrice G is indicative of predominance relations between choices.

**Tenth step) Forming effective and general matrice (ultimate predominance matrice) (H):**

Common elements \((h_{kl})\) are formed of two matrices of G and F and form a genera matrice (H)

For decision-making:

\[ H = [h_{kl}] \text{ } m \times m \text{ and } h_{kl} = f_{kl} \cdot g_{kl} \]

Formula No. (11): (Asgharpur, Mohammad javad, 1992)

**Eleventh step) Omitting less attractive choices and final ranking of choices:**

General matrice of H indicates the order of relative preference of choices, meaning that \(h_{kl} = 1\) shows that \(A_k\) is prefed to \(A_j\) both in terms of harmonious criterion and nonharmonious criterion, thus, \(A_k\) may be predominated by other choices, thus, the condition for \(A_k\) using ELECTRE method be an effective choice is that:

\[ h_{kl} = 1 \rightarrow 1 \text{ for at least one } \begin{array}{c} = 1, 2, \ldots; k \neq l \\ \text{in a way that } \rightarrow 1 \\ h_{kl} = 0 \rightarrow 1 \text{ for all is } \begin{array}{c} = 1, 2, \ldots, m; i \neq k, i \neq l \\ \text{in a way that } \rightarrow 1 \\ \end{array} \]

Simultaneous existence of these two conditions may be rare. Thus, the effective choices could easily be recognized from matrice H, in this way that each column from H which consists of at least on element equal to unit, could be omitted because that column is predominated by a row or rows.

**Advantages of using ELECTRE technique**

1. In cases where the assumption of even desirability is raised, that is, desirability for each index increases and reduces evenly, the use of ELECTRE has emphatically been recommended.

   (Like present investigation which given the easy arrangement of indexes under discussion in increasing and reducing form, this technique has been used).

2. In put data for this method consists of raw amount of different indexes in decision matrice and weight vector of W for these indexes and its output is as selecting the best choice from existing choices.

3. The threshold domain of C and D is almost optional, in a way that by reducing C and increasing D the number of effective choice could be decreased and as a result a unique choice is obtained.

4. This method leads the results obtained by decision-makers on a subject and complicated problem toward selecting the best choices effectively and systematically in other words in this method, decision-makers can only determine the weights of indexes logically and cannot impose their tastes. (That given the safety of the method in determining the winners of bid, this technique has been used in this study).

5. Concerning problems where measuring the relative advantage of a choice in relation to other choices and also measuring relative disadvantages of a choice is concerned, using this method which can combine negative desired values and positive desired values of indexes, will result in one of the most accurate choices.

6. A method could be grown and developed which four versions of it, that is, ELECTRE I, II, III, IV have already been presented.

7. The specific advantage of using this technique compared to other compensating methods MCDM (compatible subsets), is that ELECTRE is more practical in determining the winners of bids compared with other similar methods such as top SIS, and so on, meaning that national oil company is among that group of DMS which is highly willing to present weights for indexes in its decision- makings, and this applies to bids and library and field studies have confirmed this concept, thus as it was mentioned, the only method among compensating (amending) methods (compatible subsets) is determining the weight of supposed indexed from DM, that is, ELECTRE method.

**Determining Assessment indexes of bidders and the importance and method of their Acquisition:**

An important component of an investigation is determining indexes which by means of them the company can determine and announce the winner bidder.

According to library and field studies conducted, most of the bids have already been conducted and the affair required by

**National oil company consists of following bids:**

1-Engineering project work
2-Service work
3-Good supplying work.
Given the importance of determining an index for each one of those jobs (tasks), the “Delfi” method was used, in this way that, at first, questionnaire no (1) was distribut among the members of bids commissions and members of technical and commercial committees of the staff and regions and then the que jionairs were collected. According to above-mentioned experts using questionnaire No. (2) and they were asked to assign indexes through questionnaire No. (1) with figures 1 to ….con sidering their importance. No. (3) given the comments presented by professionals.

Given the point that in ELECTRE method determining the weights of indexes is conducted in studying No. (2) questionnaires collected, in explanation section, the experts referred to a deliberative point, that is, given the experiences and instructions of the company depending on the volume and type of bids especially in engineering/ project work and goods- supplying jobs, the required classification should be considered and this important issue was observed in questionnaire using DM, in another review the professionals were asked to weigh the weight of indexes from zero to one hundred which were recognized more important in previous stage.

Therefore, indexes which were considered more important by experts in questionnaire No. (2), in question No. (3), these indexes were sent to experts so as to determine the coefficient of weights observing the volume and type of bid and

The results were sent to another experienced expert in order to obtain a logical and ultimate conclusion in regard with determining the weight of indexes.

1. Determining input indexes:

Given Delfi method and views of experts, ultimately the input indexes were determined in each bid for determining the winner according to tables (1,2,3):

| Table 1: Input indexes and their weight coefficient in the bids related to engineering/project work |
|---|---|---|---|
| Row | Input Index | In tenders up to 20 times of average transactions | In tenders up to over 20 times of average transactions | In contract work of designing manufacturing and efficiency |
| 1 | Bidder offered price | 30 | 30 | 30 |
| 2 | Financial power | 40 | 25 | 20 |
| 3 | Work record advantage in previous jobs | 30 | 15 | 15 |
| 4 | Knowledge and experience concerning desired field | - | 15 | 10 |
| 5 | Equipment power | - | 10 | 10 |
| 6 | Technical, planning and management power | - | 5 | 5 |
| 7 | Technical knowledge about study and design | - | - | 5 |
| 8 | Experience in regard with goods supply | - | - | 5 |
| Sum | | 100 | 100 | 100 |

| Table 2: Input Indexes and their weight coefficient in tenders related to service work |
|---|---|
| Row | Input index | Weight coefficient |
| 1 | Bidder’s recommended price | 30 |
| 2 | Knowledge and experience about desired field | 20 |
| 3 | Work record advantage in previous jobs | 20 |
| 4 | Financial power | 30 |
| Sum | Sum | 100 |
Table 3: Input Indexes and their weight coefficient in goods supply jobs

<table>
<thead>
<tr>
<th>Row</th>
<th>Input index</th>
<th>Weight coefficient</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Biiddcr’s recommended</td>
<td>30</td>
</tr>
<tr>
<td>2</td>
<td>Financial power</td>
<td>30</td>
</tr>
<tr>
<td>3</td>
<td>Assessing previous customers and good fame</td>
<td>20</td>
</tr>
<tr>
<td>4</td>
<td>Records and experiences</td>
<td>20</td>
</tr>
<tr>
<td>5</td>
<td>Production standards</td>
<td>-</td>
</tr>
<tr>
<td>6</td>
<td>Exclusive representative of desired goods</td>
<td>-</td>
</tr>
<tr>
<td>7</td>
<td>Quality discipline and the method of guaranteeing goods</td>
<td>-</td>
</tr>
<tr>
<td>8</td>
<td>Having other valid certificates from qualified authority</td>
<td>5</td>
</tr>
</tbody>
</table>

Table (3): Input Indexes and their weight coefficient in goods supply jobs:

2-Output index:

Output index means determining the winner of the bid during the process which is conducted through performing model on input index given exercising weight coefficients.

3-Determining the winner of the bid (superior choice);

-ELECTRE decision- making model was used to determine the winner of the sample bid in a way that influential indexes and their weights are put in the models the data of the investigation and in the end, the winner of the bid is assigned.

a) Determining decision matrice (D):

In this case, study which is of technical engineering bid type, five bidders with the names A1, A2, A3, A4 and A5 (choices), obtained required scores (over 60) in each one of the indexes from technical commercial committee, thus, the envelope containing price recommendation was delivered to and received from them. In present method, the bid commission for determining the winner of the lowest price offered, selected choice A1 as the winner of the bid but in this model, a different conclusion will be experienced and the results will be compared with each other. Given the scores obtained by bidders and their proposed prices, first the decision matrice is determined.

a) Indexes:

\[ r_1 = \text{price offered by bidder (in million real)} \]
which. The less it is, the more desirable DM will be, thus it has reducing desirability and in the next stage it will be display by \( r_1 \).

\[ r_2 = \text{Knowledge and experience in the given field (score from 100)} \]
which the more it is, the more desirable it will be for DM, so it has rising desirability and in the next stage it will be displayed by \( r_2 \).

\[ r_3 = \text{Good work record in previous jobs (score from 100)} \]
which The more it is, the more desirable it will be for DM, hence, it has rising desirability and in the next stage it will be displayed by \( r_3 \).

\[ r_4 = \text{Financial power (score from 100)} \]
which The more it is, the more desirable it will be for DM, thus it has rising desirability and in the next stage it will be displayed by \( r_4 \).

\[ r_5 = \text{Equipment power (score from 100)} \]
which The more it is, the more desirable it will be for DM, hence, it has rising desirability and in the next stage it will be displayed by \( r_5 \).
\( r_6 \) = Technical, planning and managerial power (score from 100) which The more it is, the more desirable it will be for DM, thus, it has rising desirability and in the next stage it will be displayed by \( r_6 \).

Matrice No. (4)

b) forming scale less matrice (ND):

Given formula (1) we will have:

\[
\delta_{ij} = \frac{r_{ij}}{\sqrt{\sum r_{ij}^2}}
\]

In this way, all the columns of decision matrice will have similar unit length from the corresponded vector and as a result, their general comparison will become easier and the following scale less matrice will be formed.

Matrice No. (5)

c) Forming heavy scale less matrice (V):

ND is a matrice in which the scores of indexes have become scale less and comparable and \( w \times n \) is a diametric matrice only whose elements will be nonzero, thus, given formula No.

(2) We will have: \( V = N_D \cdot W \cdot n \times n \)

Matrice No. (6)

\[
\begin{bmatrix}
0370 & 0330 & 0361 & 0340 & 0378 & 038 \\
0407 & 0385 & 0413 & 0397 & 0378 & 043 \\
0444 & 0440 & 0465 & 0510 & 0486 & 043 \\
0481 & 0495 & 0516 & 0454 & 0432 & 048 \\
0518 & 0550 & 0465 & 0510 & 0540 & 048
\end{bmatrix}
\]

Matrice No. (7)

\[
\begin{bmatrix}
011 & 0049 & 0036 & 0051 & 00380019 \\
0122 & 0058 & 0041 & 0059 & 00380022 \\
0124 & 0066 & 0046 & 0076 & 00480022 \\
0144 & 0074 & 0051 & 0068 & 00430024 \\
0155 & 0082 & 0046 & 0076 & 00540024
\end{bmatrix}
\]

D) Determining Harmonious set and non harmonious set through matrice (D):

Harmonious set of \( C_k \) from \( A_k \) choices and \( A_j \) will include all indexes which \( A_k \) over \( A_j \) will be prefered based on them and nonhumrionious set of is a set of \( D_k \) indexes free from indexes of harmonious set which is computed according to following formula:

\[
\text{Agreeable set: } \left\{ j \big| r_{kj} \geq \max_{j \neq k} \delta_{kj} \right\} \quad \text{Disagreeing set: } D_{kj} = r_{kj} - \delta_{kj}
\]

e) Harmonious matrice (agreeable matrice) (c):

The amount of C resulted from agreeable set form this matrice.

\[
C = \begin{bmatrix}
- & 04 & 03 & 03 & 03 \\
07 & - & 035 & 03 & 03 \\
07 & 07 & - & 065 & 07 \\
07 & 07 & 035 & - & 05 \\
07 & 07 & 07 & 055 & -
\end{bmatrix}
\]

Matrice No. (8)

f) Forming non harmonious matrice (disagreeing matrice):

This criterion is computed using matrice V elements based on non harmonious set (disagreeing set) \( D_k \) and also by using formula No. (6):

\[
D_k = \max_{j \neq k} \left| V_{kj} - V_{kj} \right|
\]

The values of d resulted from non harmonious set from the non harmonious matrice (disagreeing matrice) \( D \):

\[
\begin{bmatrix}
- & 1 & 1 & 08485 & 09545 \\
07857 & - & 1 & 07272 & 08485 \\
030950714 & - & 04 & 05161 \\
1 & 1 & 1 & - & 1 \\
1 & 1 & 1 & 07857 & -
\end{bmatrix}
\]

Matrice No. (9)

Unit elements in matrice G ( )is an indicator of and effect and predominant choice over another.

g) Forming genera and effective matrice (ultimate predominance matrice) (H):

By multiplying elements of two matrice, that is, F and G by each other, namely, by using formula No. (H) we will have:

\[
H = [h_{kj}]m \times m, \quad h_{kj} = f_{kj} \cdot g_{kj}
\]

\[
\begin{bmatrix}
A_1 & A_2 & A_3 & A_4 & A_5 \\
A_2 & 0 & 0 & 0 & 0 \\
A_3 & 1 & 1 & 0 & 0 \\
A_4 & 0 & 0 & 1 & 1 \\
A_5 & 0 & 0 & 0 & 1
\end{bmatrix}
\]

\[
H = A_1 \cdot A_2 \cdot A_3 \cdot A_4 \cdot A_5
\]
Matrice No. (12)

At this time less attractive choices are omitted in a way that each …….. of matrice H which is equallo L, shows that in that …… choice K is preferable to choice L both in terms of harmonion criterion and non harmonious criterion thus, choice K may still be predominated and confirmed by other choices. Therefore, each column of H which consists of at least one element equal to 1 could be omitted since that column is predominated by a row a rows, thus, it is observed. In this bid, the column of choice \( A_3 \) is considered as effective choice from matrice H since other columns of this matrice which consist of at least one element equal to unit (l) can be omitted and in fact they are ineffective choices.

Another method for determining the effective choice, is drawing arrow from one choice toward other choices which in matrice H consist of the intersection of the element equal to unit (l), thus each choice which is not pointed to by the point of the arrow is introduced as the effective choice, that is, choice \( A_3 \) is the prefered choice and is known as the winner in the bid.

\[
\begin{align*}
A_1 & \\
A_2 & \\
A_3 & \\
A_4 & \\
A_5 & 
\end{align*}
\]

Figur (1)

DISCUSSION

If investigators believe that in selecting contractors in bids just the offered priced should not be considered the criterion of selection. Un for tunity in most construction project since the budget of the plan is supplied from governmental financial sources, tendency toward selecting lower price is always high and this trend leads to reduction in the quality of conducting construction projects. Given the point that in present method of the company offering the least price in the bid by the bidder is the criterion of selection. Thus, in the sample bid of this study in contracting company (choice) \( A_1 \) with offering the least rate, that is, 1000 milion Rial given the definition of bids, namely, the point that the least price is considered the winner and later for different reasons including low financial power and inappropriate tehnical, equipment and managerial power, this contract was about to stop and confiscate the deposit related to commitment for doing the job well on the side of the contractor, but the choice which in this study was suggested as winner in the bid was \( A_3 \) which was the preferable choice compared to other choices given the total assessment indexes a hile the price offered for this choice was equal 1200 million Rial and it was more then that of choice \( A_1 \) but index assessment resultant it was preferable to choice A and other choices and our scienific method ELECTRE led us to the original definition of bid under focus by lawmaker, that is the lowest price and through scientic and logical combing of all indexes and their weights revealed that it is a defendable and respectable method in this field.

I.Comparative study between traditional method and the method used in this study, regarding determining the winner in the bid in the company, that is, showed that the offerer of the lowest price is announced as the winner using scientic method of ELECTRE and for the purpose of making a scientific and logical selection, all aspects should be considered and combined in a scientific model in order to select the best and the most appropriate choice as the winner of the bid.

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